“A STUDY OF FACTORS INFLUENCING SEROMA FORMATION AFTER MODIFIED RADICAL MASTECTOMY ”

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This is to certify that this dissertation tilted **"ASTUDY OF FACTORS INFLUENCING SEROMA FORMATION AFTER MODIFIED RADICAL MASTECTOMY"** is bonafide record of work done by **DR SANDEEP BAFNA,** during the period of her post graduate study from May 2011 – April 2014 under guidance and supervision in the department of general surgery, Kilpauk medical college, Chennai, in partial fulfillment of the requirement for **M.S. General surgery** degree Examination of the TamilnaduDr MGR Medical University to be held in April 2014.

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DECLARATION

I, Dr **SANDEEP BAFNA** hereby declare that this dissertation **"A STUDY OF FACTORS INFLUENCING SEROMA FORMATION AFTER MODIFIED RADICAL MASTECTOMY"** is a bonafide, genuine research work done by me under the guidance of **DR. KANNAN, ASSOCIATE PROFESSOR OF THE DEPARTMENT OF GENERAL SURGERY, KILPAUK MEDICAL COLLEGE**, Chennai

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Dedicated to

22 million people in the world who are cancer patients...

6 million people who die of cancer every year...

15 million people who will be diagnosed as new cancer patients

in the year 2020...*

* Stewart BW and Kleihues P (Eds): World Cancer Report.IARCPress. Lyon 2003, p11, 304

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My acknowledgment will be incomplete if I do not thank all **my patients** without whose co-operation, I would not have been able to conduct this study.

Finally nothing is possible without the blessings of the omnipotent **Almighty.**

Dr. SANDEEP BAFNA

GIVE ME STRENGTH

This is my prayer to thee, my lord - strike,

strike at the root of penury in my heart.

Give me the strength lightly to bear my joys and sorrows.

Give me the strength to make my love fruitful in service.

Give me the strength never to disown the poor

or bend my knees before insolent might.

Give me the strength to raise my mind high above daily trifles.

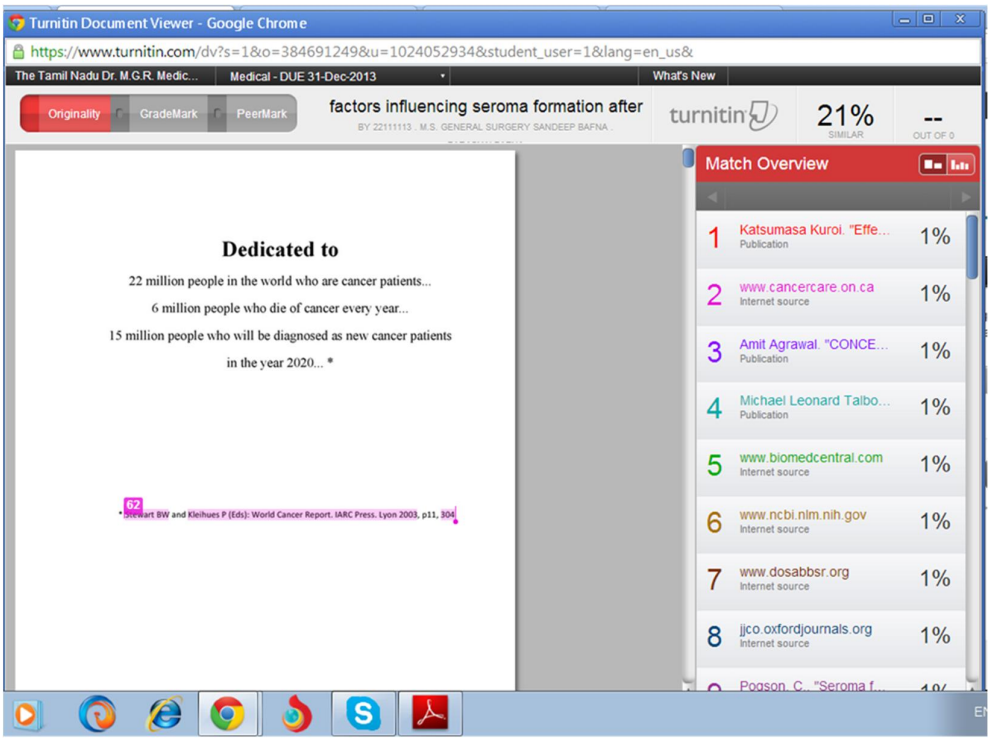
And give me the strength

to surrender my strength to thy will with love.

Gitanjali, R.N. Tagore

ABBREVIATIONS

ALND	-	Axillary Lymph node dissection
BCS	-	Breast Conservation Surgery
MRM	-	Modified radical mastectomy
DCIS	-	Ductal carcinoma in situ
EC	-	Electrocautery
ER	-	Estrogen Receptor
FAL	-	Functional Lympadenectomy
IDC	-	Infiltrating Ductal Carcinoma
ILC	-	Infiltrating Lobular Carcinoma
LCIS	-	Lobular carcinoma in situ
LN	-	Lymph nodes
LVI	-	Lymphovascular Invasion
MRM	-	Modified Radical Mastectomy
NAC	-	Neoadjuvant Chemotherapy
NS	-	Not Significant
PR	-	Progesterone Receptor
RCT	-	Randomized Control Trial
SLNB	-	Sentinel Lymph node Biopsy
US	-	Ultrasonic Scalpel
PM	-	Pectoralis major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ABSTRACT

Background & Objectives:

Seroma, is the most frequent post operative complication after breast cancer surgery/modified radical mastectomy (MRM), developing in approximately 30% of cases. The pathophysiology and mechanism of seroma formation in breast cancer surgery remains controversial and not fully understood, as little attention has been paid in the literature to etiologic factors. To prevent seroma formation, it is important to estimate individual risk of seroma formation.

Aim of the study :

To establish an association between various risk factors of seroma formation and to know whether the risk factors act independently or by synergism.

Methods:

Patients with breast cancer undergoing Modified Radical Mastectomy were included in the study. The proportions were compared using Chi-square test of significance and the student" „test was used to determine the statistical difference. The data was analyzed using SPSS package.

Results:

16 out of 50 patients, accounting for 32 percent, developed seroma. compared to patients without seroma formation. 15 of 16 patients who had developed seroma were hypertensive, accounting for 68.2%, pvalue was significant 0.001. The mean BMI in seroma patients was 26.16 +1.79(21.30-28.40) , p value was significant

0.001. The mean drain output on pod 1 was 200.3+ 36.44 in seroma group, p value was 0.032. Mean drain removal day was 15.50 + 1.82 (13-19), p value was 0.036 in seroma group. Other variables studied had no statistical significance with respect to seroma formation.

Conclusion: The factors influencing seroma formation following modified radical mastectomy for carcinoma breast were found to be Hypertension and BMI , having a significant association for seroma formation .

EVOLUTION OF SURGICAL TECHNIQUE

Hippocrates : associated breast cancer with cessation of menstruation, **Leon ides** is acknowledged to be the 1 st operative treatment for breast malignancy.

Andreas Vesalius (b. 1514), Flemish physician, advised mastectomy for breast cancer and practiced the use of sutures than cautery to control bleeding.

Servetus, advised that the underlying muscles (pectoralis major & minor) to be removed as well as the axillary glands.

Wilhelm Fabry (b. 1560), the, Father of German Surgery, devised an instrument for mastectomy as shown in figure 1.

Mitchell Banks of Liverpool, in 1877 practised removal of axillary glands in all cases of breast cancer.

Dr. Joseph Pancoast ,was first **to show** enblock removal of axillary glands as shown in figure 2

The rationale for the Halsted radical mastectomy was largely to achieve locoregional control of the breast malignancy.

In contrast to the Halsted radical mastectomy, the modified radical mastectomy defines a surgery of complete breast removal, with the inclusion of the tumour, overlying skin, and axillary lymphatics, with preservation of the pectoralis major muscle.

Murphy in 1912 had stopped Halsted radical mastectomy and started preserving pectoral muscles. This was based on the experiences of **Bryant** .

The Consensus Development Conference on the management of breast malignancy in 1979 stated that the modified radical mastectomy was the standard of treatment for women with stages I and II breast cancer[4]

Figure 1: Mastectomy instruments of Fabry von Hilden in late sixteenth century.

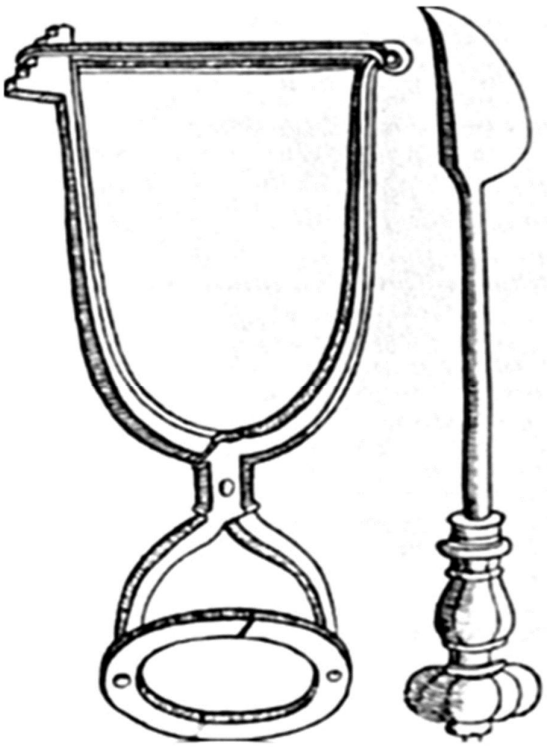


Figure 2: Mastectomy (1844) of Dr. Joseph Pancoast in the preanesthetic and pre antiseptic era. En bloc removal with axillary lymphatic drainage

INTRODUCTION

The term breast is derived from **latin** word mamma (cf. mammal from latin mammalis " of the breast "). Breast are modified sudoriferous glands , composed of glandular , adipose , and connective tissues .

Breast cancer is the commonest malignancy in women affecting one out of eight women worldwide and ranks among the top ten causes of death in women.[1,2] more than a million cases are diagnosed each year , rise in incidence is due to increased life span , life style changes and improved survival from other illness, and better investigation to diagnose early breast malignancy. It forms thirty three percent of all female cancers and for twenty percent of cancer related deaths in women . Almost half of all patients with a palpable primary breast cancer will have lymph node metastases at presentation compared with only one fifth of those with a non palpable cancer detected on mammography.[2] In majority of patients with breast malignancy, excision of the tumour with (ALND) remains the standard treatment for invasive breast cancer[3]

Metastases in axillary lymph nodes is the most determinant of prognostic factor in patients with primary breast malignancy.

Almost all patients develop patches of numbness or paraesthesia and many patients develop reduced shoulder mobility and chronic lymphoedema.[4] Seroma is an abnormal accumulation of serous fluid in the dead space of axilla, the breast following breast-conserving(BCT) surgery and is the commonest sequel. The

incidence of seroma formation varies between 5 and eighty five per cent.[4, 9, 14-20] Seroma can increase the morbidity , prolong the hospital stay , need for multiple aspirations , wound gaping , erythema , delay the chemotherapy cycles.[4]

The type of surgery, the operating surgeon, preoperative radiation or chemotherapy, the amount of post operative physical activity, use of electrocautery, use of closed su ction drains and closure of dead space have been implicated as potential factors influencing the likelihood of seroma formation.[4-7]

Constant chest wall movement due to respiration and shoulder use creates shearing forces that delay flap adhesion.[5] For this, several techniques of flap fixation or wound drainage, limitation of postoperative shoulder movement and the use of adhesive glue have been investigated to improve primary healing and minimize seroma formation.[6] To reduce the incidence of seroma formation , it is essential to estimate individual risk for seroma formation , and future trials should be aimed at identifying predictive variables and thus reduce the incidence of seroma .

REVIEW OF LITERATURE

DEFINITION

There are various definitions for seroma as published in many article ,**Classe et al**[7] defined axillary seroma as a palpable fluid accumulation causing discomfort and needing aspiration.

Woodworth et al[8] during a retrospective analysis defined seroma as a clinically identifiable collection of serous fluid within a surgical cavity. They treatedseromas with serial aspirations until no further fluid collections are detected.

Nadkarni et al[9] defined the presence of postoperative seroma as a need to aspirate serous fluid from the axillary cavity more than once,or, 2 or more times after removal of the axillary drain.

Benjasirichai et al[11]defined postoperative seroma as any collection in the axilla that was detected by ultrasonography 2 weeks after the patient was discharged.

Hashemi et al[10] defined axillary seroma as any clinically apparent fluid collection in the axilla or under skin flaps .

SEROMA INCIDENCE

Seroma frequency varies between 5 & 85%.[3, 9, 14-20]

Table 1: SEROMA INCIDENCE

Authors	Study Type	Surgery	Patients(n)	Incidence (%)
Chen et al, 1998[15]	RCT	MRM,BCS	40	4.8
Gupta et al, 2001[16]	RCT	MRM	121	48
Purshotham et al, 2002[17]	RCT	MRM,BCS	375	51
Jain et al, 2004[18]	RCT	MRM,BCS	116	26
Lumachi et al, 2004[19]	RCT	MRM,BCS	92	40
Unalp et al, 2007[20]	Retrospective	MRM,BCS	119	14.3
Nadkarni et al, 2007[9]	RCT	MRM,BCS	160	84.7

PATHOPHYSIOLOGY

Seromas are collection of lymph exudates or ‘‘serum’’ in cavities, invariably due to surgery and healing process of inflammation.[14,22] . Continuous chest wall and shoulder movements disrupt the flap opposition to chest wall.[24]

Bonnema et al[25] showed that the fibrinogen level in seroma was very low compared with plasma on day 1 but on day 5 and 10 post operatively it was virtually undetectable,and that peripheral lymph does not clot and contains only a trace amount of fibrinogen.

Oertli et al[14]presumed that fibrinolytic process leads to seroma formation. **Tadych and Donegan**[21]believed that seroma is due to the leakage of lymph from disrupted lymphatics in the axilla. Extensive manipulation and to the tissues creating a raw area in (MRM) leads to seroma formation from severed blood vessels & lymphatics and compared to (BCT) which produces less seroma.[22] Ideal closure of wound will reduce lymph spillage& serum ooze, will approximate flaps to the underlying structures appropriately thus eliminating the dead space.[3]

FACTORS AFFECTING SEROMA FORMATION

Seroma is considered to be a side effect of surgery than a complication ,it can lead to significant morbidity like wound dehiscence , delay in initiation of adjuvant chemotherapy .

Kuroi et al[28], review included one Meta analysis, 51 RCTs, 7 prospective &retrospective. They divided the risk factors for seroma formation into four categories: Patient and tumor characteristics, Surgical Factors, Post operative management, Non Surgical Modalities.

PATIENT AND DISEASE FACTORS

The incidence of seroma has been shown to correlate with patient's age,breast size, and hypertension,presence of malignant nodes in the axilla,number of malignant nodes,previous surgical biopsyand use of heparin.[19, 28, 29]patients who received chemotherapy before surgery had problems of wound healing and increased seroma occurence.[8]

Gonzalez et al[27]observed that neo adjuvant chemotherapy did not affect seroma occurrence.

Kumar et al[29] found a significant association b/w **BW** and **HTN** with seroma **but no association between nodal status or positivity of lymph** nodes, hormone receptor status and stage with seroma formation. there was no corelation with other factors such as ,DM , size of the breast, grade of the tumour , side

Table 2: Association of Patient and Disease factors with Seroma formation[28]

Patient Factors	Association	Disease Factors	Association
Age	Inconclusive	Disease Stage	↔
Menstrual Status	↔	LN Status	↔
Side/Tumor location	↔	Tumor size	Inconclusive
Hypertension	↔	Histological type	↔
Diabetes	↔	Grade	↔
Body weight	↑	Specimen size/weight	↔
Anemia	↔	Pathological Tumor size	↔
Breast size	↔	LN positivity	Inconclusive
NAC/ Prior Biopsy/RT	↔	Hormone Receptor Status	↔
BMI/Obesity	Inconclusive		

↑ = Increases seroma formation

↔ = No definite association

SURGICAL FACTORS

Type of Surgery

Seroma incidence is lower after BCS than MRM.[19,27] sentinel lymph node biopsy has prevented larger dissections thus in BCS seroma is less.

Woodworth et al[8]proved that reconstruction following MRM decreased seroma formation. There was no correlation seen with preserving pectoral fascia [30]

AXILLARY DISSECTION

Time and again large number of studies have proved there is no corelation with number of axillary lymph nodes removed and seroma .[27, 31-33]

Purushotham et al[32] in the RCT involving 298 patients with early breast cancer who were clinically node negative, patients were randomly allocated to undergo ALND (control group) or SLNB followed by ALND if subsequently found to be lymph node positive (study group).). (SLNB) is associated with very less seroma & morbidity than ALND.

Its been demonstrated that a long procedure time and diagonal skin incision as compared to vertical skin incision increased seroma .[28,34]

Table 3: Association of operational factors with seroma formation[28]

Increases Seroma	Decreases Seroma	No Association	Inconclusive Evidence
Extended RM	Ultrasonic Dissection	Extent of LN dissection	Surgeon
Diagonal Skin Incision	Immediate Breast Reconstruction	Removal of pectoral Fascia	Pressure Garment/ Compression dressing
Operation time	Suture Flap fixation	Type of Anesthesia	MRM Vs BCS
Electrocautery	SLNB Vs ALND	Laser Scalpel	Skin graft
		Adhesive Glue	
		Blood loss	

SURGICAL TECHNIQUE/ INSTRUMENT

Tissue handling & dissection play a vital role in determining the occurrence of seroma. It islearnt that proper tissue handling and to minimize the bleeding and trauma to lymphatics can prevent seroma formation.[3]

Electro cautery has its own advantages of short duration, with less amount of blood loss but has its own problems of wound complications & seroma as shown by **Porter et al**[35] and **Keogh et al**[36] through RCTs. However, studies **by Unalp and Onal**[20] **and Nadkarni et** al[9] have failed to show any statistically significant difference in seroma formation between knife dissection and electrocautery dissection.**Irshad and Campbell**[37]said harmonic scalpel reduced seroma formation.

Lumachi et al[19] randomized ninety-two women to undergo axillary dissection by either using ultrasound scissors (Group A, 45 patients) or not (Group B, 47 patients). Twenty-eight patients developed wound seroma. In patients with ultrasonic dissection drains were removed earlier .

Kontos et al[39]prospectively randomized 32 patients who underwent modified radical mastectomy to either HS or electrocautery (EC). First 48 h drainage, total drained volume, aspirated volume, complications and required analgesia were comparable in the two groups and concluded that no significant reduction in seroma formation or wound complications and pain could be found with the use of HS.

Kerin et al[41] failed to show the difference in postoperative seroma drainage between argon-enhanced electro surgery and conventional diathermy.

Table 4: comparative studies between , electrocautery and Ultrasonic dissection

Authors	Type of Study	Total Patients	Surgical Technique (No. of patients with seroma)	P value
Porter et al, 1998[35]	RCT	80	EC(38) Vs Sharp(13)	0.01
Galatius et al, 2003[42]	Comparative	59	Sharp(69) Vs US(67)	NS
Lumachi et al, 2004[19]	RCT	92	Sharp(42) Vs US(20)	NS
Nadkarni et al, 2007[9]	RCT	158	EC(68) Vs Sharp(59)	NS
Unalp et al, 2007[20]	Retrospective	119	EC(12) Vs Sharp(5)	NS

Sharp = dissection with sharp scissors Laser = dissection with argon laser

DRAINS

Frequently drains are used after breast cancer surgery with the understanding that it will reduce seroma formation. The mechanism proposed is that the suction helps skin flaps to adhere to the underlying structure & axilla sealing off all leaking lymphatics. And thus, may facilitate wound healing, decrease wound infection, flap necrosis and prevent seroma formation.[3]

Drain Vs. No Drain

Talbot and Magarey[43] evaluated prospectively three groups of consecutive patients with breast cancer having axillary lymph node clearance. In the delayed removal group, 30 patients had total or partial mastectomy with axillary dissection, followed by closed suction drainage until the fluid output was < 50 mL in 24 h. In the early removal group, 30 patients had the same procedures, except that the drains were removed 2 days postoperatively, irrespective of the volume of drainage. In the 'no drain' group, 30 patients underwent partial mastectomy and axillary clearance without inserting any drain. Patients without drain needed more serial aspiration.The aspiration in each group being 2.1, 2.9, and 3.9, respectively. The observed that earlier removal of drain following ALND got discharged earlier with not much of wound infections.

Jain et al[18]randomized 116 patients undergoing MRM to receive suction drainage or no drain . There was a significant reduction in hospital stay and postoperative pain scores in patients who did not have a drain. Following

mastectomy without a drain, the use of fibrin sealant reduced seroma formation(P< 0.012). **They observed that drains did not prevent seroma formation**.

Single vs many Drains

Terrell and Singer in 1992[44]randomized 84 women undergoing (MRM). 37 patients had one axillary drain and 47 had two drains placed postoperatively, one in the axilla and the other beneath the pectoral flaps. The average total drainage was 870.4 mL per patient in the group with single drain and 997.4 mL per patient in the group with two drains and the overall complication rate was 35.0 percent and 31.9 for single drain group and two drain groups respectively. These differences did not reach statistical significance. They concluded that use of a single axillary drain after MRM seems to result in no increase in postoperative complications, may reduce the incidence of flap necrosis.

Petrek et al[45] in their study randomized 65 patients with carcinoma to two groups, single or multiple drains. For axillary dissection, randomization to multiple drains meant placement of four catheters in the axilla, and randomized to the single drain, one catheter in the axilla. Multiple drains didn't confer any added advantage to single drain over amount & duration of fluid drainage.

Suction vs Passive drain

Traditionally, wound drainage was done using static drains, such as tube or Penrose drains. However, since the development of continuous closed suction

drainage in 1947 by Murphy[46], closed suction drainage has superseded static wound drainage, as this increases freedom of movement, decreases need for bulky dressings and the incidence of infection is drastically reduced and requires less time for nursing care.

Nadkarni et al[9] randomized 160 patients with breast malignancy , This enabled them to know the effect of 2 different factors use of scissors/electro cautery and suction/corrugated drains on the occurence of postop seroma formation . They concluded that the use of different surgical methods or drainage has no effect on the postop seroma formation.

Low pressure Suction vs High-pressure drain

The negative pressure on the suction drainage has been found to be significantly influence postoperative drain output , a high negative suction drain may disrupt the severed lymph vessels from sealing off thus leading to prolonged drainage leading to increased hospital stay.[47]

Wedderburn et al[48] compared the use of low pressure and high pressure drains in 69 patients following mastectomy and axillary clearance. The results revealed no statistically significant difference between the two groups of patients ($P>0.05$) in terms of daily drainage

Bonnema etal[49] compared effect of negative pressure on fluid production RCT in 141 patient. Not much difference noticed b/w the low & the high vacuum

group in volume and duration 9.5 vs 10 days of seroma production, There was **a positive correlation b/w BMI and seroma.**

Early Drain removal vs Late Drain removal

Many surgeons removed drain when it is less than 20–50 mL in the preceding 24 hr , which delayed their discharge, causes discomfort to the patient, and increased the overall costs.[16,21,51-55] This also delays starting on adjuvant radiotherapy or chemotherapy and wound healing. Prolonged drainage may also increase the hospital stay and the risk of infection by allowing retrograde migration of bacteria.Indiscriminate or premature withdrawal of postoperative drains irrespective of the amount of fluid drained may be accompanied by an increase in the incidence of axillary seromas.[51-54]

Gupta et al[16] randomized121 patients into five-day group (n=64) and eight-day group (n=57). They concluded that 5-day post-operative drainage is as safe as 8-day post-operative drainage in the management of patients undergoing major breast surgery, but results in an increase in seroma aspiration and aspiration volume

Parikh et al[52]randomized 100 patients having undergone (MRM) to either drain removal at 3 or at 6 days post-operatively. More seroma occurred in the group whose drain was left in situ longer.

Liu and McFadden[53] studied 50 consecutive patients undergoing a standard breast conservation surgery & ALND for breast cancer. The axilla drained with 7-

Fr suction drain. drains were removed after POD 1 & prior to discharge from the outpatient surgical center.No complications were seen in all 50 patients **This short-term method reduced the incidence & the morbidity of seroma formation.**

Baas-Vrancken Peeters et al[54] conducted an RCT comparing twenty fourhr to long-term drainage. Mainly duration in hospital stayed was taken into account and followed by seroma and its complications. Each group had 50 patients.In 24 h drainage , short stay in hospital noted**(2.5 vs., 4.6 , P < 0.001**). They **observed that 24 h drainage following ALND is economical and free of wound complications and seroma formation compared to long term drainage.**

Dalberg et al[30] studied the results from a multicentre randomized trial which included 247 patients had undergone (MRM) five Swedish hospitals between 1993 and 1997. Of these 247 patients a total of 198 patients were supposed to have the drain removed 24 h later or to keep the drain till < 40 ml / day discharge**. earlyremoval had more chances of seroma formation(48% vs. 20% P < 0.001)**and a shorter stay in hospital(2.8 days vs. 4 days, P <0.001)

The evidence in established worksopined in favour of early drain removal with less wound complications .

EXTERNAL COMPRESSION DRESSING

The use of pressure garment or compression dressings is to reduce the dead space by giving an external force onto the flaps and to facilitate flap attachment to underlying muscle, and thus reduces the seroma formation.

Chaturvedi[57]used external compression and found lessseroma occurence. He used 6" crepe bandages, which were applied circumferentially around the chest wall,immediately after the operation with the opposite breast was included in it.

Chen et al[15] in their study randomized 41 patients with breast cancer to getpressure garment to be used after surgery or not. The garment was worn from the 1st post-op day up to 14 days. They found no added advantage in post-op drainage with the use of a pressure garment. More problems were seen with the patients without pressure garments.seroma occurred in patients not using the garment. The use of the pressure garment appeared to increase the duration of use of the drain (6.8 vs. 6.1 days), these differences in the two groups was not significant.

O'Hea et al[58] in an RCT randomized 135 patients undergoing surgical treatment for breast malignancy to receive a external compression or conventional dressing. Dressing remained till postop day 4. Patients in the standard dressing were done with a front-fastening Surgibra only. Drains were taken out when the drainage was < 50 cc only. Duration of drains in both the groups were almost similar. **The external compression dressing did not give any additional**

advantage to prevent seroma formation, frequent use of a compression in all cases to reduce postoperative drainage afterALND for breast cancer is not warranted.

Kontos et al[59] compared 200 patients who had undergone MRM were given external compression on the skin flaps and the axilla immediately (group A) with a patients of no external dressing group (B). Drains were removed when drain output< 30 ml per day, or on post op day 8. Mean time with drains kept in situ were 4.9 and 5.5 days in groups A and B. The differences seen were significant. They concluded that these findings are supportive of pressure dressing as an effective method to reduce seromaformation .

Unalp and Onal[20]**,** in their retrospective analysis of 119 patients observed out of 101 patients who were given compression dressing postoperatively, 12 developed seroma whereas five patients developed seroma out of the 18 patients who did not use compression dressing. The P value of 0.158 was not significant and they concluded that compression dressing was not a factor that reduces seroma formation

Figure3 : Application of Compression Bandage - Technique

Sterile gauze pads kept over the surgical wounds

Elastoplast bandages applied with pressure covering IpsilateralHemithorax in layers

Post application of Compression dressing

Table 5: Obliteration of dead space by external pressure

Authors	Type of Study	Patients (n)	Study Method	P value
Chen et al, 1998[15]	RCT	40	Pressure Garment (0) Vs None (5%)	NS
O'Hea et al,1999[58]	RCT	135	CD Vs Normal dressing	CD > Normal (P<0.01)
Unalp et al,2007[20]	Retrospective	119	Pressure Garment (12%) Vs None (28%)	NS
Kontos et al, 2008[59]	Comparative	400	Pressure Garment (2.5%) Vs None (16%)	Significant

NS = Not Significant CD = Compression Dressing

SUTURING OF SKIN FLAPS

Larsen et al[61] used subcutaneous suture to fix the flaps to the deep muscles and fascia with 35 to 50 fine cotton sutures after (MRM) with external pressure dressing.This procedure gave good cosmetic result and with less morbidity and faster recoveryand drastically reduced seroma formationand drains were removed earlier than other patients.

Chilsonet al[31] used a flap tacking procedure that closes the axillary fossa dead space and tacks the mastectomy flaps to the chest wall. This study in (MRM) demonstrated a significant decrease (25.4% vs. 38.6%, P = 0.038) in the incidence of seroma when flap tacking was performed. They opined that the flap tacking procedure reduced post mastectomy seromas, (P < 0.0001).

Schuijtvlot et al[62] in a prospective audit 97 patients following breast-conserving surgery for carcinoma with axillary dissection found that the use of an additional buttress suture inserted between the axillary skin and the chest wall decreased the occurrence of seroma from 52% to 24% (P<0.007). The buttress suture was a no. 1 size prolene suture was placed through the axillary skin, passed into the Serratus Anterior muscle on the chest wall, thus obliterating the axillary space.

In the RCT by **Hamy et al**[63], axillary padding with FAL gave satisfactory cosmesis, reduced seroma occurrence.(27% vs. 80%, P<0.001) in patients undergoing BCS without axillary drainage.

prospective study by **Classe et al[7],**100 womenwere randomly allocated to two groups, axillary padding without drain (n=47) or axillary suction drain (n=51).In the axillary padding group, the length of hospital stay was significantly reduced from 4.5(±2) days to 1.8(±1) days (P <0·001).

Coveney et al[64] in RCT involving 39 patientsundergoing (MRM) were randomized to undergo flap fixation to underlying muscle or conventional skin closure. Drainage had reduced significantly than in skin closure patients ($P < 0.05$) in the group with flaps fixed ,in flap sutured group few developed seromas, 5 (25%) vs. 17 (85%), $P < 0.001$. They concluded that suturing skin flaps to underlying muscle reduces local morbidity

In the RCT by **Purushotham et al [17]**, 375 patients undergoing surgery for breast malignancy were segregated to conventional surgery or suturing of flaps with no drain. Patients segregated to control arm had 2 suction drains mastectomy flap which were removed, once volume was<fifty ml/day or at post op day 5, whichever occurred earlier. In the study arm, the flaps were fixed to the underlying PM muscle and Serratus anterior muscles with multiple 3 – 0 Vicryl sutures , starting at the apex of the axilla and cephalic aspect of upper flap. Long thoracic nerve was secured. No sutures were inserted in the cavity of the breast following wide local excision. The results revealed a significant reduction in hospital stay.

Figure 4: Dead space after Axillary dissection[11]

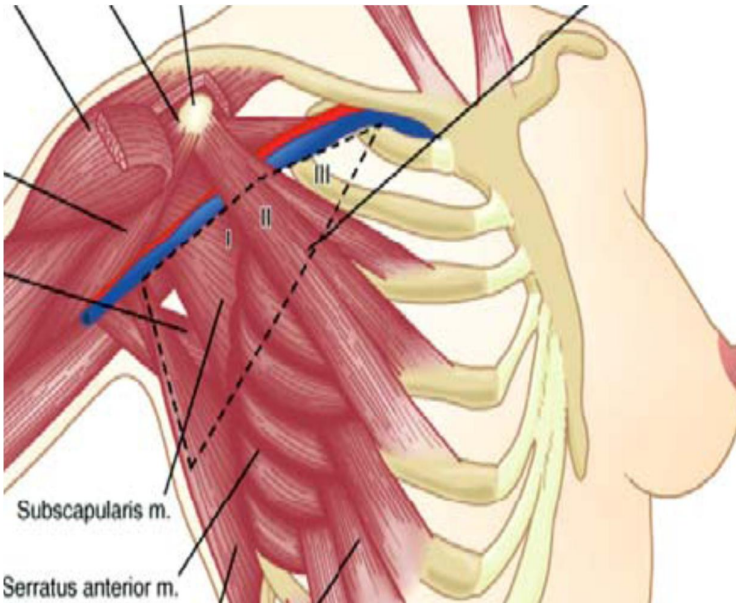
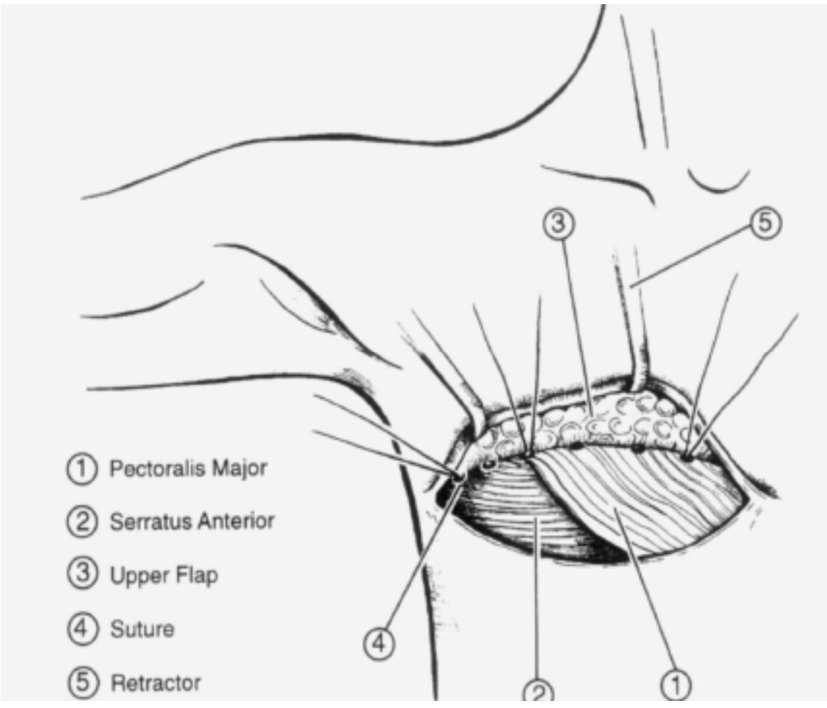


Figure 5: Suturing of dead space after mastectomy[17]



POST OPERATIVE FACTORS

Shoulder Exercise

Shamley et al [23], in a study of delayed vs early postoperative exercise following (MRM), showed that evidence from 12 RCTrecommend the use of delayed exercise (P = 0.00001) to reduce seroma formation.Delayed shoulder exercise is much more better thanimmediate postoperative exercise at reducing seroma and there is no evidence that it wil derange shoulder movements .

Drain Output

Barwell et al[51] compared 63 patients after BCS (n = 37) or MRM (n=26). Suctiondrains were removed after a median of 4 days . In all, 32 patients (51%) later developed seroma requiring needle aspiration.Seroma formation was associated with a larger total suction drain volume. The median yield of axillary lymph nodes was significantly greater in those who developed seromas (11 vs. 8; P< 0.002). There was not much change in the volume drained 24 h preceding drain removal (mean 60 ml vs. 50 ml). Thus, they observed that longer in situ drains was not much useful to prevent seroma formation.

Kopelman et al[47]**in a** RCT trial defined the correct time to remove the drain after MRM 90 patients. 42 were randomized to have the drain removed on postoperative day 3, and the rest to keep it till <35 ml/24 hours. Main outcome measure ere the formation of seroma, wound infections, need to reinsert the drain,

and duration of hospital stay. Earlier the drain removed, carried a risk of seroma formation (9/42 compared with 2/48, p = 0.02) unless the total amount of fluid drained during the first 3 postop days was less than 250 ml.

Unalp and Onal[20] from their retrospective analysis of 119 patients conclude that later removal of drains didn't increase seroma occurence rate. They observed that a drain volume > 50 mL/ day for 2 days following surgery affected seromadevelopment. They,recommend drainage to be continued till flow rate at 48 hours is seen and daily drainage is lower than acceptable limit (up to 25 mL/ days).

Loo and Chow[12] in their retrospective analysis of 119 patients identified drain output exceeding 500 ml in first three postoperative days and drainage more than eight days as significant risk factors for seroma formation. **Lumachi et al**[19] observed that total drainage is a predictor for seroma formation.

ADJUVANT THERAPY

Seroma can delay the initiation of adjuvanttherapy in patients after MRM.However, adjuvant chemotherapy and radiotherapy can contribute to seroma formation. **Sultan and Madhere**[65]reported a case of seroma formation 4 years after breast reconstructive procedure and while on docetaxel . They did not establish a definite causal relationship between seroma formation and docetaxel.

NON-SURGICAL MODALITIES

Due to the associated complications and time constraints associated with the surgical management, Fibrin glue was used which interacted with the damaged tissues andfavouring the fibroblasts growth and in wound healing . It favors haemostasis by preventing hematomas, which delay the surgical healing processes, blocks the lymphatic channels and thus reducingseroma formation; closes the dead spaces through tissue adhesion.

Table 6: Recent randomized trials using tissue sealants

Author	Total Patients	Sclerosant used	Seroma with / without sealant (%)	P value
Ulusoy et al, 2003[68]	54	Fibrin glue	18/11	NS
Jain et al, 2004[18]	58	Fibrin glue	34/41	0.01
Mustenan et al, 2004[69]	40	Fibrin glue + aproptinin	20/26	NS
Johnson et al, 2005[70]	82	Fibrin glue	37/45	NS
Ruggiero et al, 2008[71]	50	Fibrin glue + collagen	11/16	0.02

Bonnema et al[25] noted that seroma contained less amount of fibrinogen. Thus use of fibrin glue with its clot forming properties reduced seroma formation.

NS = Not Significant

Jain et al[18] showed that there was a positive correlation with the use of fibrin sealant on seroma occurence,consequent use of drains led to clot disruption and not adding to much advantage .

Johnson et al[70] found no reduction in seroma formation and concluded that the fibrin glue was not cost effective , technique involved in its application is difficult indicated that it has no added advantage over normal suction drains

Ruggiero et al[71]conducted an RCT randomized 50 patients who underwent MRM. Fibrin glue spray and a collagen patch were applied to the axillary fossa in half of the patients, the other half were treated conventionally. Suction drainage was removed b/w post op days 3 & 4. Seroma amount and duration were significantly reduced and seroma aspiration and multiple hospital visits drastically reduced .

Mustenan et al[75], studied the use of fibrin glue & fibrinolysis inhibitor, he demonstrated that there was not much effect on seroma formation.

Still further randomized control studies are needed to effectively point out the causative factors for seroma formation and it is difficult toidentify patients who will suffer from seroma.

AIMS AND OBJECTIVES

- To establish an association between various risk factors of seroma formation.
- To know whether the risk factors act independently or by synergism

SURGICAL ANATOMY

Gross Anatomy

Breast is situated in superficial fascia of anterior thoracic wall .it consists of 15 to 20 lobes wit fibrous tissue and adipose tissues. Deep layer of superficial fascia covers the posterior aspect of breast, the retromammary bursa is situated between deep layer of superficial fascia and clavipectoral fascia .[4]

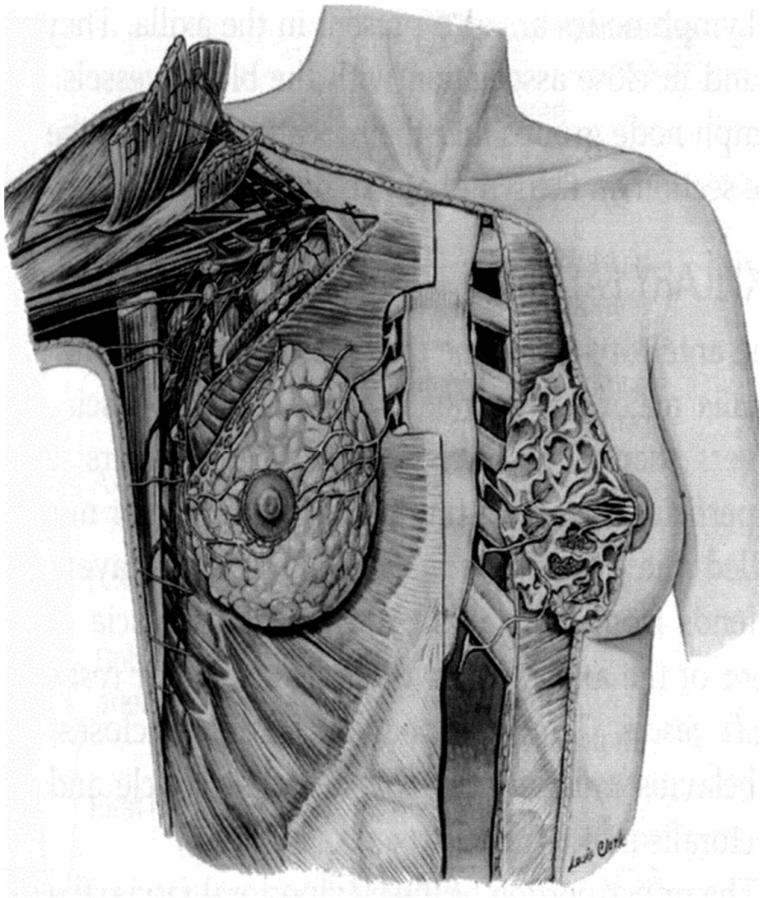
Axilla

Pyramidal shaped between the upper extremity and thoracic wall .it consists of 4 walls, an apex ,& a base . Base is made up of axillary fascia and skin . Apex is an aperture and extends into neck through cervicoaxillary canal. The anterior wall is made up of pectoralis major(PM) and minor muscle(Pm) .posterior wall is made up of subscapularis muscle , lateral wall is made up of humerus , medial wall is made up of serratus anterior muscle .

Breast is located just deep to dermis, suspensory ligaments of cooper pass from the septa that divides the breast into multiple lobules .

components of the brachial plexus, and axillary LN groups are seen. On the left side, the breast is cut to expose its structure in saggital view.

Figure 6: The contents of the axilla, axillary artery & vein



BLOOD SUPPLY

Breast is supplied by

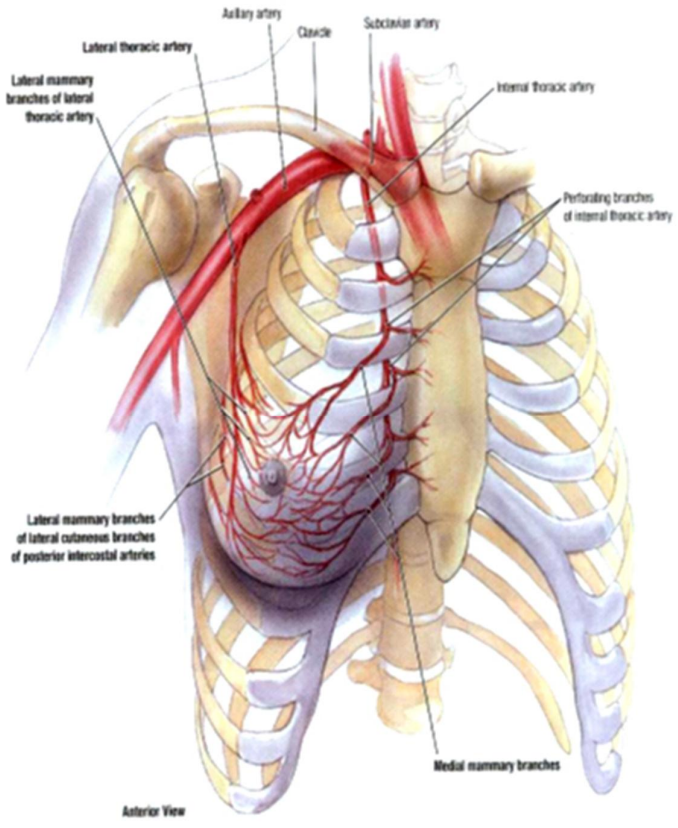
1. Branches of internal mammary artery
2. Branches of posterior intercostal arteries
3. axillary , lateral thoracic , &thoracoacromial artery .

Venous Drainage

1. Drain into internal thoracic vein
2. Tributaries of axillary vein
3. Perforating branches of posterior intercostal veins

Bastons plexus of veins provide a route for metastatic emboli to reach the vertebral bodies , ribs and CNS

Figure 7: Diagrammatic Presentation of blood supply to breast



LYMPHATIC DRAINAGE OF THE BREAST

1. The lateral group, made up of 4 to 6 LN that lie near to axillary vein

2. The anterior group consists of 4 or 5LN major portion of the drainage of lymph from breast is to this group . Lymph drains primarily from these lymph nodes into the central LN

3. The posterior group, made up of 6 to 7 LN that lie along thesubscapular vessels.

4. The central group made up of 3 to 4 lymph nodes that are present in the axilary pad of fat usually behind to the pectoralis muscle.Lymph from thecentral nodes passes directly to the subclavicular (apical) nodes.

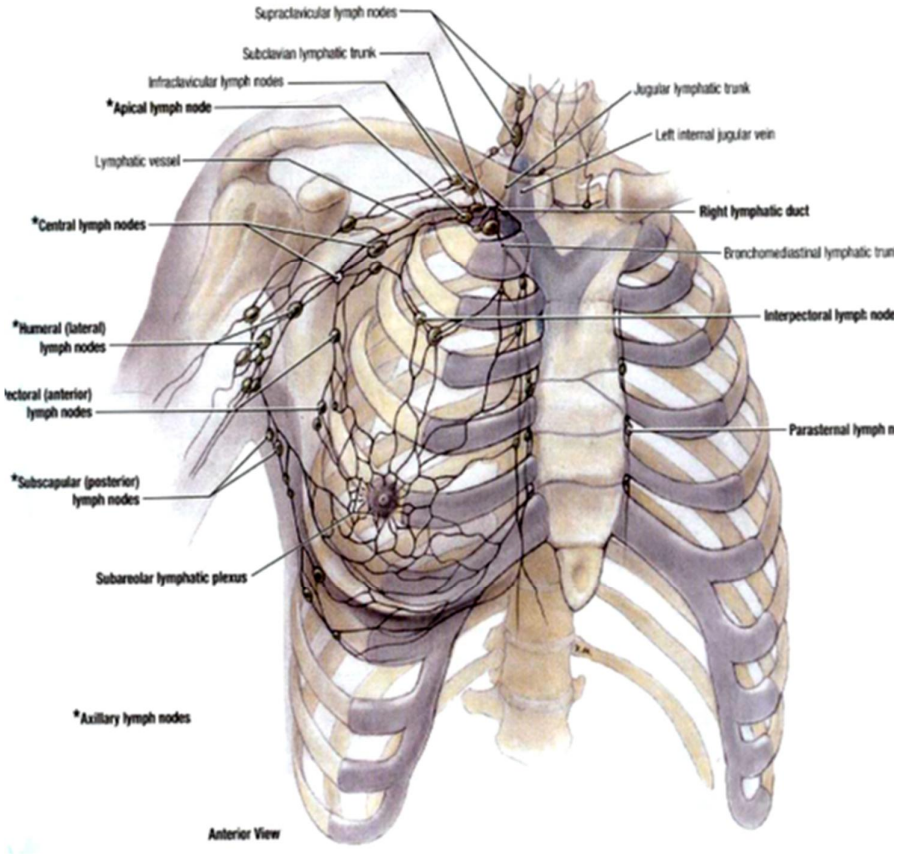
5. The apical group, made up of 6 to 12 LN located partly posterior to the upper border of the Pm and partly superior to it. They mayReceive lymph directly or indirectly from all the other groups of axillary lymph nodes.

6. The Rotter‘s group, consists of 1 to 4 small LN that are located Betweenthe PM and minor muscles in association with the pectoral branches of thethoracoacromial vessels.

Internal mammary group is situated in retrosternalspaces, the right internal mammary group drains into right lymphatic duct, and the left enters the main thoracic duct.Cross communication between lymphatics from each breast,explains the metastatic involvement of opposite breast and axilla.

Sub areolar plexus plays no important in lymphatic drainage of breast.

Figure 8: diagrammatic representation of lymphatic supply of breast.



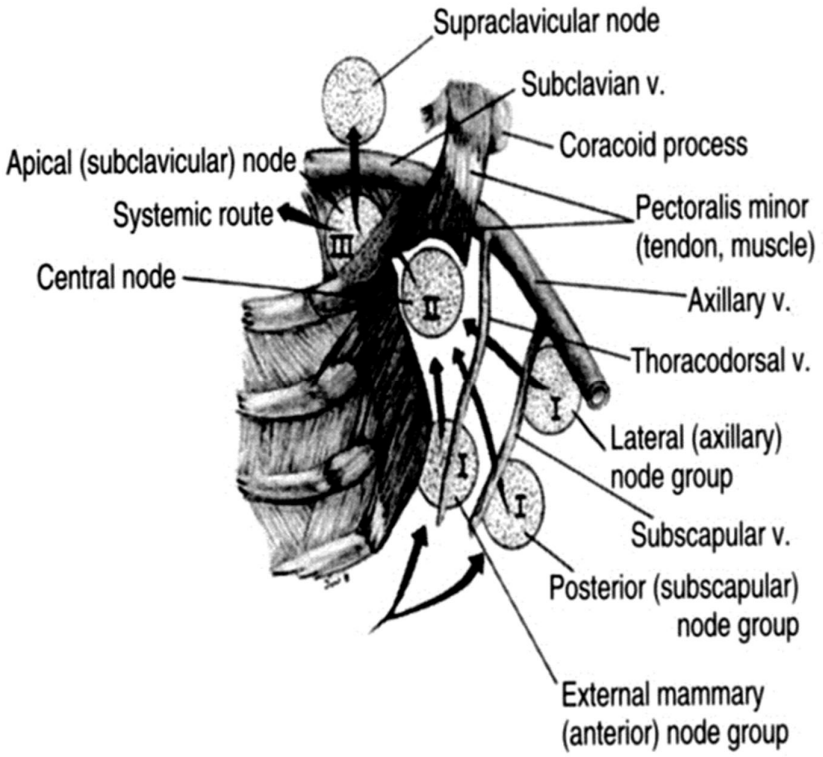


Figure 9: Level I lymph nodes include the anterior, lateral &scapular groups; level II, the central group; and level III, the apical. There are three levels or groups of lymph nodes that are defined by their location relative to the pectoralis minor. The direction indicates the general direction of lymph flow. The axillary vein and its major tributaries associated with the pectoralis minor are included

CLASSIFICATION OF BREAST TUMORS

Table 7: Histological Classification of Breast Tumors

1 EPITHELIAL TUMOURS

A. Benign

1. Intraductal papilloma
2. Adenoma of the nipple
3. Adenoma
    a. Tubular
    b. Lactating

a. Malignant

b. Non invasive

c. DCIS

d. LCIS

2. Invasive
    a. Invasive ductal carcinoma(IDC)
    b. IDC with predominant intraductal component
    c. Invasive lobular carcinoma
    d. Mucinous carcinoma
    e. Medullary carcinoma
    f. Papillary carcinoma
    g. Tubular carcinoma
    h. Adenoid cystic carcinoma
    i. Secretory carcinoma
    j. Apocrine
    k. Carcinoma wit metaplasia
3. Squamous type

4. Spindle cell type
5. Cartilaginous and osseous type
    a. Mixed type
    b. Others

II Mixed connective tissue and Epithelial tumors
    a. Fibroadenoma
    b. Phyllodes tumour
    c. Carcinosarcoma

III. Miscellaneous tumours
    a. Soft tissue tumours
    b. Skin tumours
    c. Tumours of haematopoietic and lymphoid tissues

IV. Unclassified tumours

STAGING OF BREAST CANCER

TNM staging system requires microscopic confirmation and histological typing of the tumour before attempting any stage classification.

Table 8: AJCC/TNM Clinical Staging System

TUMOUR(T) Tx	Primary tumour cannot be assessed
T0	No evidence of primary tumour
Tis	Carcinoma in situ
Tis (DCIS)	DCIS
Tis(LCIS)	LCIS

Tis pagets disease	Pagets disease of the nipple with no tumour
T1	Tumours <2cm in greatest dimension
T2	Tumour > 2cm and not more than 5 cm in greatest dimension
T3	Tumour > 5cm in greatest dimension
T4 T4a T4b T4c T4d	Tumour of any size with direct extension t To (a) chest wall (b) only as described below Extension to chest wall , not including pectoralis muscle Oedema or ulceration of the skin of the breast or satellite nodules confined to the same breast Both T4a and T4b Inflammatory carcinoma

REGIONAL LYMPH NODES

Nx	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis to movable axillary lymph node
N2 N2a N2b	Metastasis in ipsilateral axillary lymph nodes fixed or matted or clinically apparent ipsilateral internal mammary nodes in the absence of clinically evident axillary lymph node metastasis Metastasis to ipsilateral axillary lymph nodes fixed to one another or to other structure Metastasis only in clinically apparent ipsilateral internal mammary nodes and in the absence of clinically evident axillary lymph node metastasis

N3	Metastasis in ipsilateral infraclavicular lymph nodes or clinically apparent ipsilateral internal mammary nodes and in the presence of clinically evident axillary lymph nodes metastasis or metastasis in ipsilateral supraclavicular lymph nodes with or without axillary or internal mammary lymph nodes involvement
N3a	Metastasis in ipsilateral infraclavicular lymph nodes and axillary lymph nodes
N3b	Metastasis in ipsilateral internal mammary nodes and axillary lymph nodes
N3c	Metastasis in ipsilateral supraclavicular lymph nodes
Mx	Distant metastasis cannot be assessed
M0	No distant metastasis
M1	Distant metastasis

Table 9: Staging of Breast Cancer

Stage 0	Tis N0M0
Stage1	T1 N0M0
Stage IIA	T0 N1 M0 T1 N1 M0 T2 N0 M0
Stage II B	T2 N1 M0 T3 N0 M0
Stage III A	T0 N2 M0 T1 N2 M0 T2 N2 M0 T3 N1 M0 T3 N2 M0

Stage III B	T4 N0 M0 T4 N1 M0 T4 N2 M0
Stage III C	Any T N3 M0
Stage IV	Any T Any N M1

MATERIALS AND METHODS

Study design : Prospective study

Study Place : Department of General Surgery

Kilpauk medical college and Government Royapettah Hospital

Duration of Study : Jan 2013 to October 2013

Number of patients: Fifty Patients

Ethical committee clearance obtained

Written informed consent obtained

Inclusion criteria

- All cases of breast cancer undergoing Modified Radical Mastectomy.

Exclusion criteria

- Cases of Mastectomy and Axillary dissection for indications other than carcinoma.

- Cases undergoing palliative mastectomies and incomplete axillary dissection.
- Cases of breast cancer surgery in males
- Previous surgical procedures in and around the axilla
- Bilateral breast cancer
- Simultaneous reconstructive surgery
- Other serious underlying medical illness(es) precluding full study participation

OPERATIVE TECHNIQUE

All patients underwent a complete clinical examination and relevant investigations required for diagnosis and staging. All participating women were informed about their diagnosis, the surgery to be performed and about the study before the surgery.

The surgery was performed under general anesthesia with patient supine on the operating table with both arms abducted. A third generation cephalosporin Cefotaxime was used as perioperative antibiotic and perioperative analgesics were used as per standard protocol. The operated side was painted and draped as per protocol. The operative technique was same throughout the study periodin patients undergoing mastectomy, a horizontal elliptical incision was used which included

the tumor with at least 2 cm skin margin. The flaps were raised using electrocautery medially up to mid sternum, superiorly up to the clavicle and inferiorly 2 cm below the infra mammary crease. Skin was closed with ethilon.

Axillary node dissection consisted of an en bloc removal of level I& II lymph nodes. Flaps were raised using electrocautery. The axillary contents were cleared from the the axillary vein extending from the chest wall to the anterior border of latissimus dorsi muscle posteriorly & anteriorly lateral border of PM muscle. The inferiorly extended up to 5th intercostal space. The ipsilateral arm was then flexed, the PM and Pm muscles were retracted, and elevated and axillary contents dissected to the apex of the axillary cavity. Care was taken to preserve the nerve to Serratus anterior and thoracodorsal nerves and vessels. A 14 to 16 Fr closed suction drain was placed in the axilla. The wounds were dressed with sterile gauze pads.

Definitions

1. A seroma is defined as any palpable fluid collection in the axilla. Any seroma aspirated once a week or earlier if required and a sample sent for culture and sensitivity.

2. Wound infection was defined as erythema, cellulitis, purulent drainage, wound gaping, skin necrosis, or positive microbiology at the incision site that needed antibiotics.

All patients were followed up in the outpatient clinics. Data was collected and recorded longitudinally.output, cumulative postoperative day 7 drain output, total drain output, duration of drainage,

Outcome Measures

The primary endpoint of the study was the incidence of seroma formation. The other parameters that were measured were postoperative day 1 drain output, cumulative postoperative day three drain , Operative details like; use of electro-cautery, suction drains ,axillary padding were also noted, implementation of upper limb (on the side operated) physiotherapy were noted. Histopathological reporting, the number of lymph nodesremoved & wound complications. Analysis of risk factors for seroma formation was also done.Seroma was managed by regular aspirations under aseptic precautions and the drain removal was delayed until the resolution of seroma.

METHOD OF STATISTICAL ANALYSIS

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD and results on categorical measurements are presented in percentage. (%). Chi-square test has been used to find the significance of study parameters on categorical scale between two groups. Student ‘t’ test has been used to determine the significance between two group means. All analyses were two tailed and $p < 0.05$ was considered significant. SPSS version 16.0 was used for data analysis.

RESULTS

DEMOGRAPHIC DATA

50 consecutively admitted female patients with the diagnosis of carcinoma breast counseled for MRM were included in the study. SIXTEEN out of 50 patients, accounting for 32 percent, developed seroma

Seroma	Frequency	Percentage
Yes	16	32.0
No	34	68.0
Total	50	100.0

TABLE 10:Distribution of seroma in study population

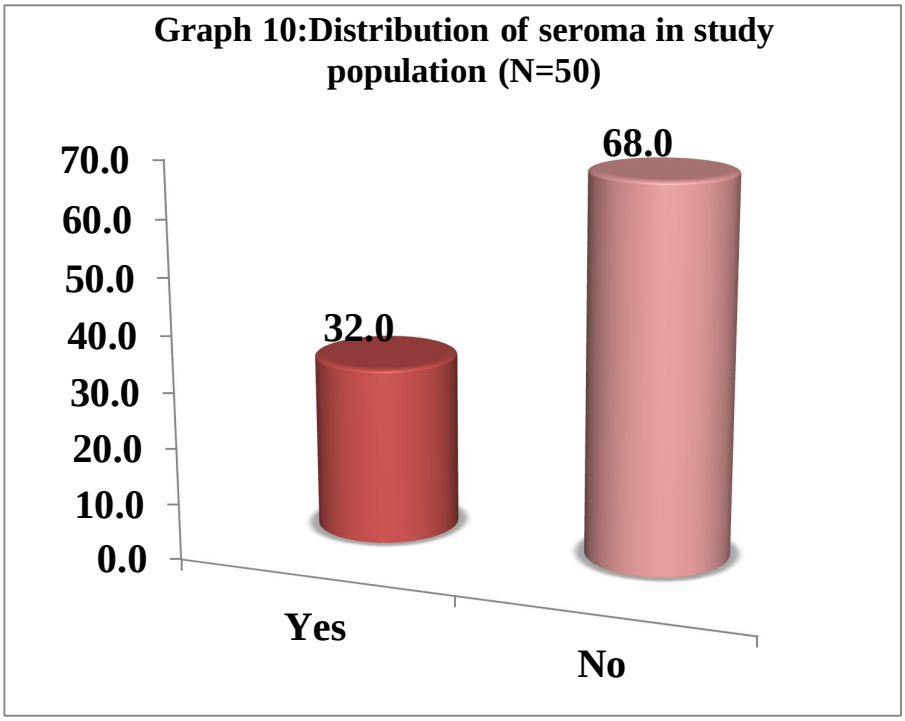
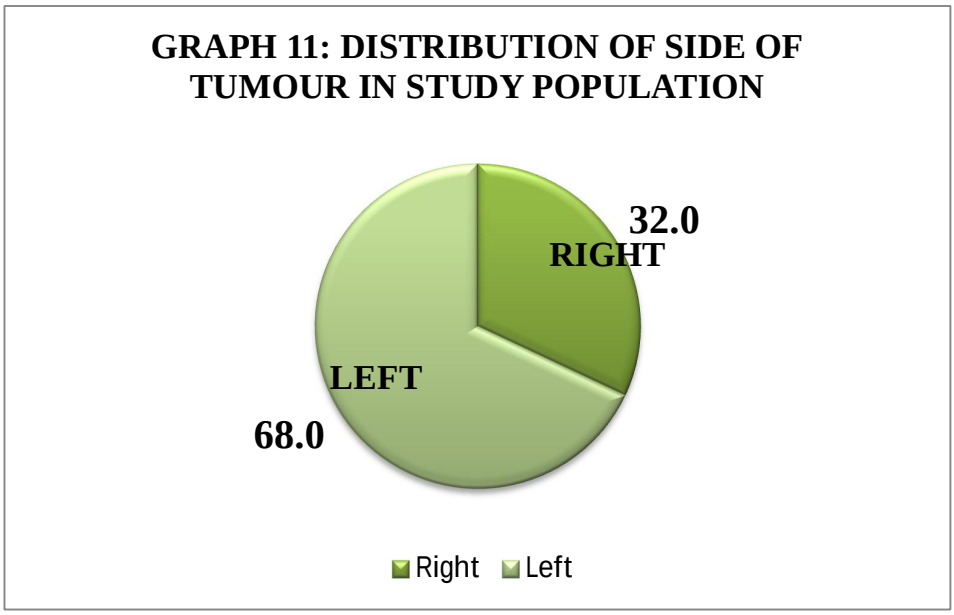


TABLE 11:Distribution Of Tumour Side In Study Population

			Seroma			'p'value
			Yes	No	Total	
side	Right	Count	6	10	16	
		% within side	37.5%	62.5%	100.0%	
	Left	Count	10	24	34	**0.805**
		% within side	29.4%	70.6%	100.0%	
Total		Count	16	34	50	
		% within side	32.0%	68.0%	100.0%	

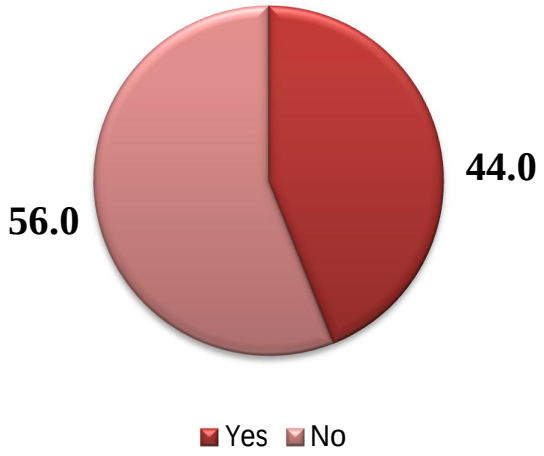


6 among the seroma group were found to be right sided tumors accounting for 37.5%,ten among the seroma were found to be left sided tumors (29.4%).P value was insignificant 0.80

TABLE 12: Distribution of Hypertension In Study Population

HTN			Seroma		Total	'p' value
			Yes	No		
	Yes	Count	15	7	22	0.001
		% within htn	68.2%	31.8%	100.0%	
	No	Count	1	27	28	
		% within htn	3.6%	96.4%	100.0%	
Total		Count	16	34	50	
		% within htn	32.0%	68.0%	100.0%	

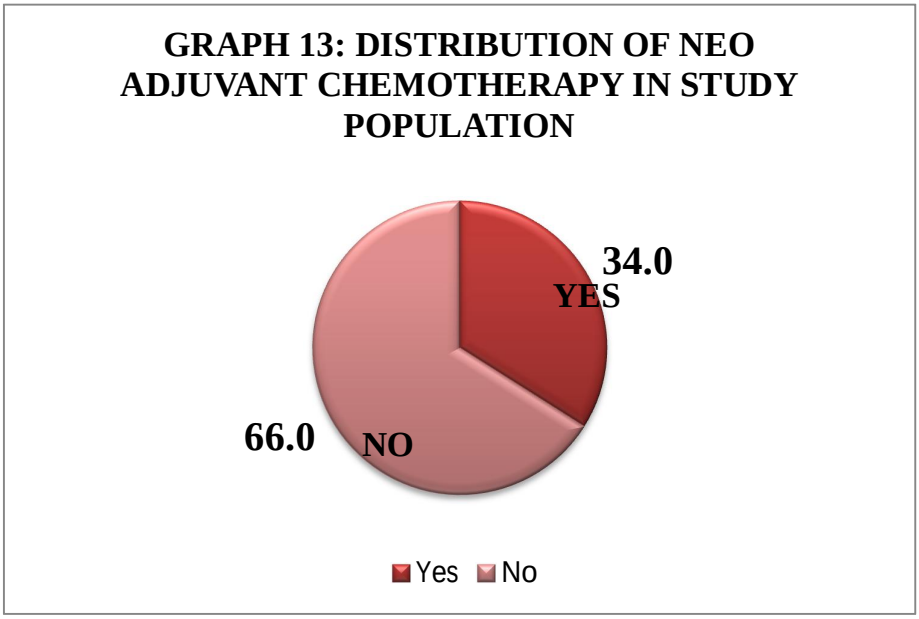
GRAPH 12: DISTRIBUTION OF HYPERTENSION IN STUDY POPULATION



15 among the seroma group were found to be hypertensive accounting for 68.2%;seven among the non-seroma group were hypertensive, 32.1%.**P value was significant 0.001**

TABLE 13: Distribution of Neoadjuvant chemotherapy in study population

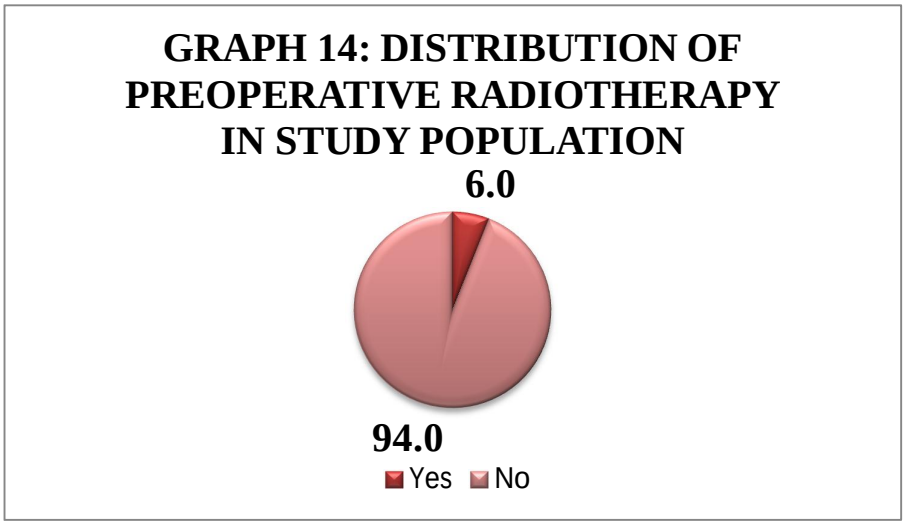
	Seroma		Total	'p'value
	Yes	No		
NAC YES	7	10	17	
NO	9	24	33	0.498
TOTAL	16	34	50	



7 patients who had received neo adjuvant chemotherapy developed seroma, and 9 patients who received no neoadjuvant chemotherapy developed seroma. P value was 0.498, statistically insignificant

TABLE 14: DISTRIBUTION OF PREOPERATIVE RADIOTHERAPY IN STUDY POPULATION

			seroma		Total	'p'value
			Yes	No		
pre_op_r	Yes	Count	1	2	3	1.00
		% within pre_op_r	33.3%	66.7%	100.0%	
	No	Count	15	32	47	
		% within pre_op_r	31.9%	68.1%	100.0%	
Total		Count	16	34	50	
		% within pre_op_r	32.0%	68.0%	100.0%	

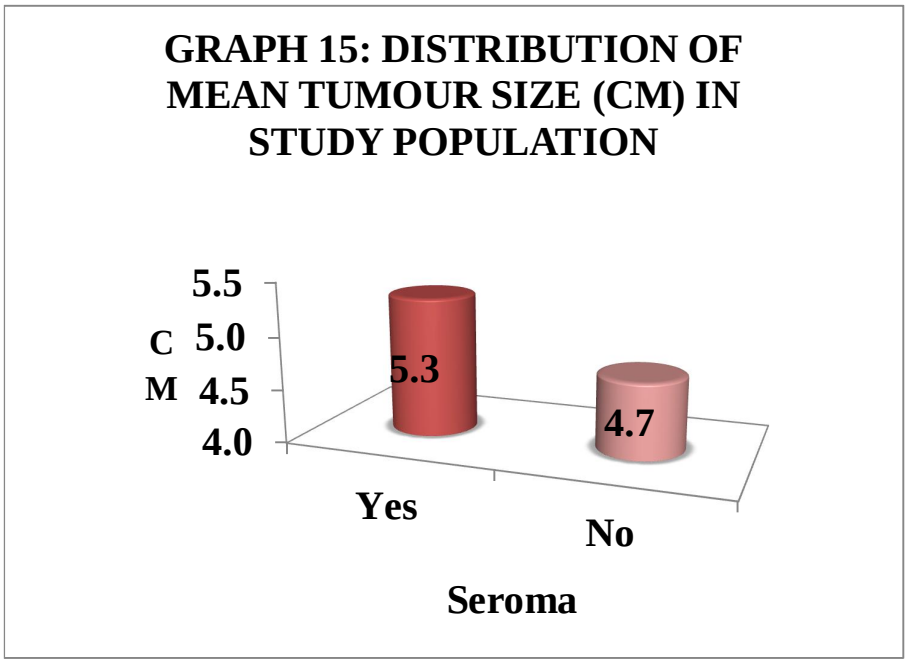


Out of 3 patients, who received preop radiotherapy only 1 developed seroma,15 patients who had not received radiotherapy developed seroma. P value was 1.000, statistically insignificant

TABLE 15:DISTRIBUTION OF MEAN TUMOUR

SIZE IN STUDY POPULATION

Seroma	N	Mean	SD	Min	Max	'p'value
Yes	16	5.31	2.41	3.00	10.00	0.403
No	34	4.70	2.35	2.00	12.00	
Total	50	4.90	2.36	2.0	12.00	



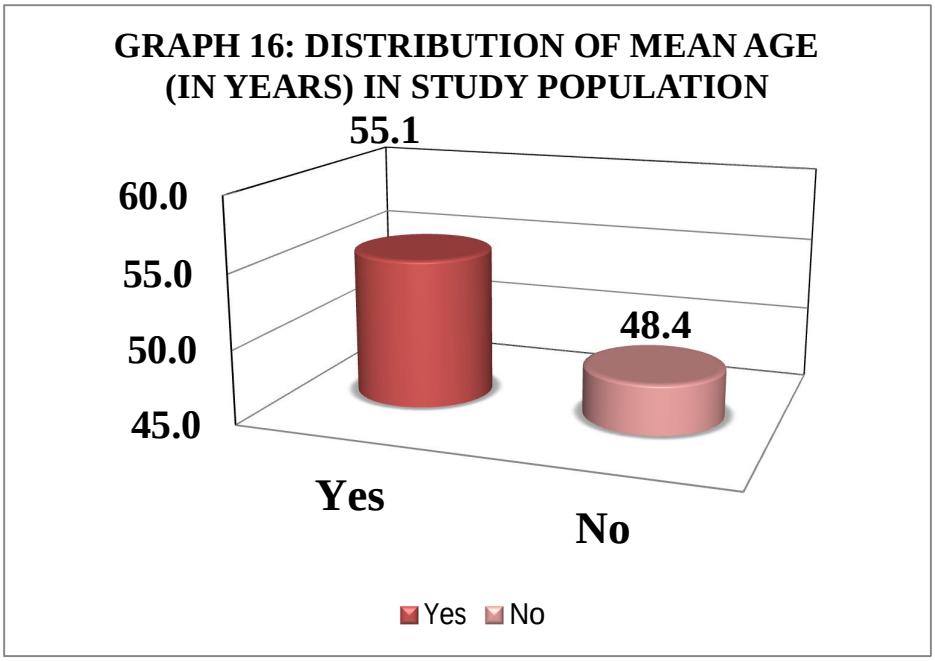
The mean tumour size of patients who developed seroma was **5.31+2.41(3.0-10.0**), whereas the mean tumour size of those without seroma was **4.70+2.35 (2.0-12.0) cm.**

P value was 0.403, statistically insignificant.

TABLE 16: DISTRIBUTION OF MEAN AGE

IN THE STUDY POPULATION

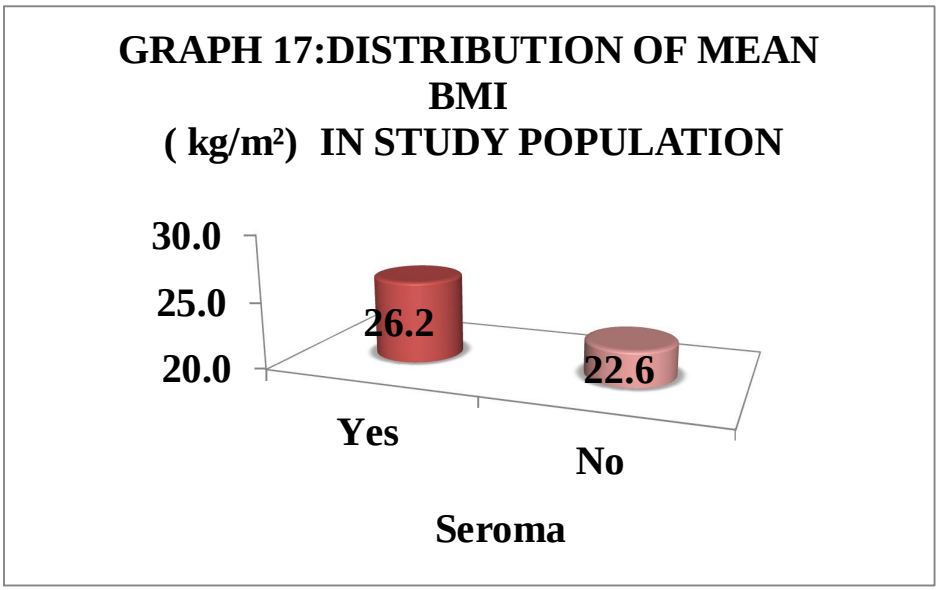
Seroma	N	Mean age in yrs	SD	Min	Max	'p'value
Yes	16	55.06	6.56	46	69	0.56
No	34	48.05	11.29	26	75	
Total	50	50.52	10.44	26	75	



The mean age of patients who developed seroma was **55.06+6.56(46-6**9), whereas the mean age of those without seroma was 48.05+11.29 (26 – 75) years.P value was 0.560, statistically insignificant.

TABLE 17: Distribution ofMean BMI (kg/m^2) in the study population

Seroma	N	Mean age in yrs	SD	Min	Max	'p'value
yes	16	26.16	1.79	21.30	28.40	0.001
No	34	22.64	2.62	18.04	29.01	
Total	50	23.76	2.89	18.04	29.01	

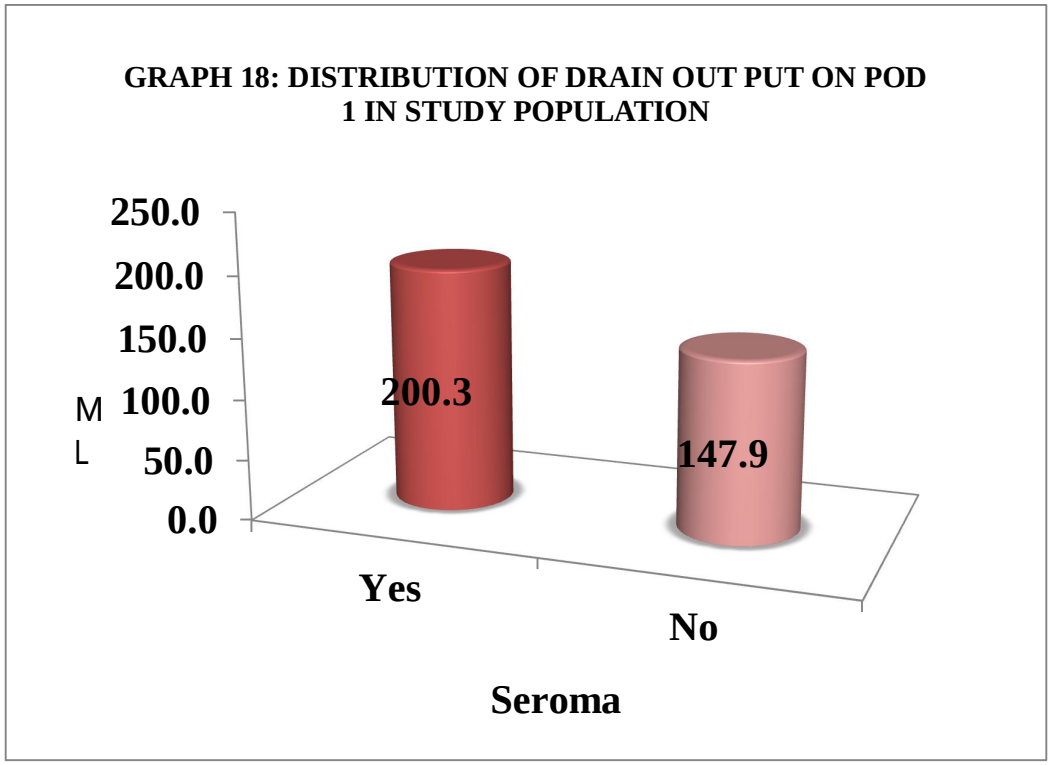


The mean BMI of those with seroma was 26.16+1.79 (21.30-28.40); the BMI for patients without seroma was 22.64+2.62 (18.04-29.01) kg/m2.

P value was highly significant 0.001

TABLE 18: Mean drain output on POD 1 in study population

Seroma	N	Mean	SD	Min	Max	'p'value
Yes	16	200.31	36.44	120	275	
No	34	147.94	29.31	100	200	0.032
Total	50	164.70	39.92	100	275	

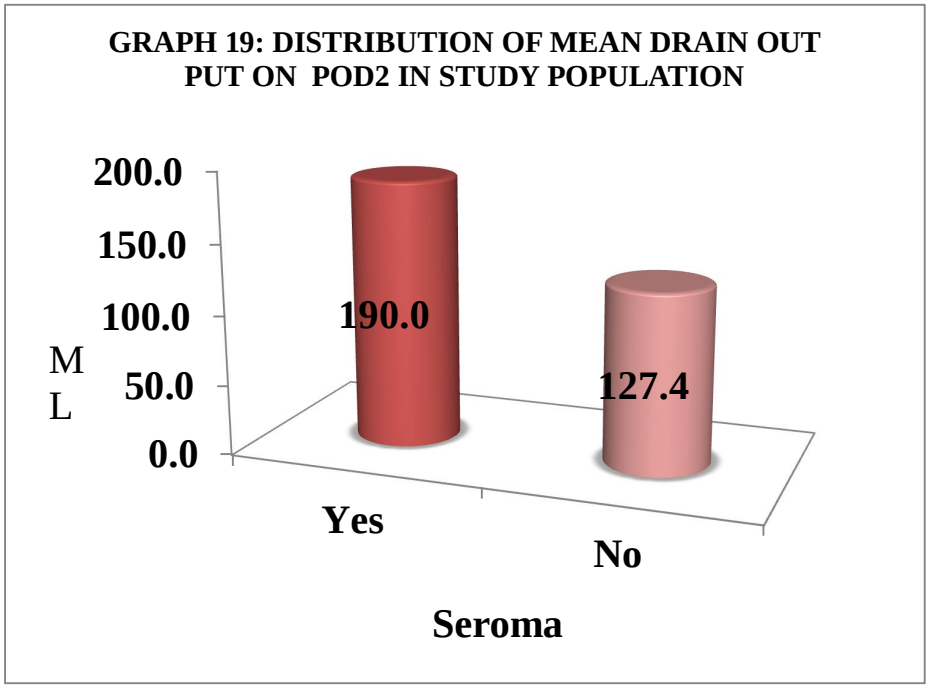


The mean drain output on day 1 in seroma group was 200.31+36.44 (120-275) and in no seroma group was 147.94+29.31 (100-200) milliliters (ml),

P value is 0.032, statistically significant.

TABLE 19: Mean drain output on POD2 in study population

Seroma	N	Mean	SD	Min	Max	'p'value
Yes	16	190.00	23.66	170	250	
No	34	127.35	35.188	70	200	0.043
Total	50	147.40	43.32	70	250	

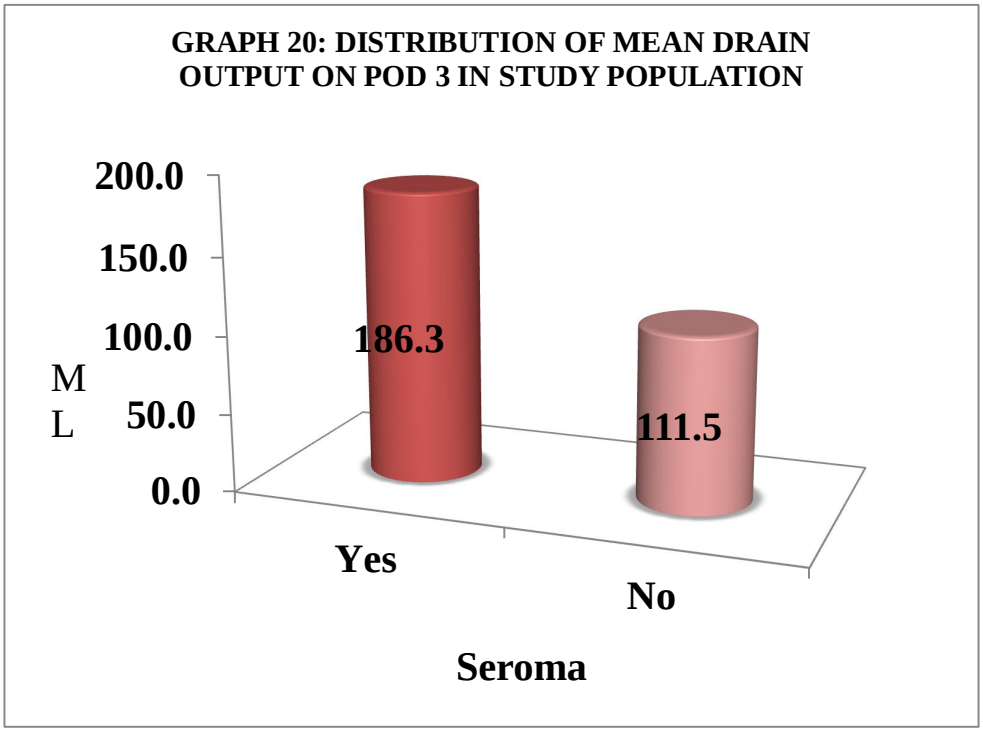


The mean drain output on day 2 in seroma group was 190.00+23.66 (170-250) and in no seroma group was 127.35+35.18 (70-200) milliliters (ml),

P value is 0.043, statistically significant.

TABLE 20: Mean drain output on POD 3 in the study population

Seroma	N	Mean	SD	Min	Max	'p'value
Yes	16	186.25	20.28	150	220	
No	34	111.47	35.43	60	200	0.021
Total	50	135.40	47.04	60	200	

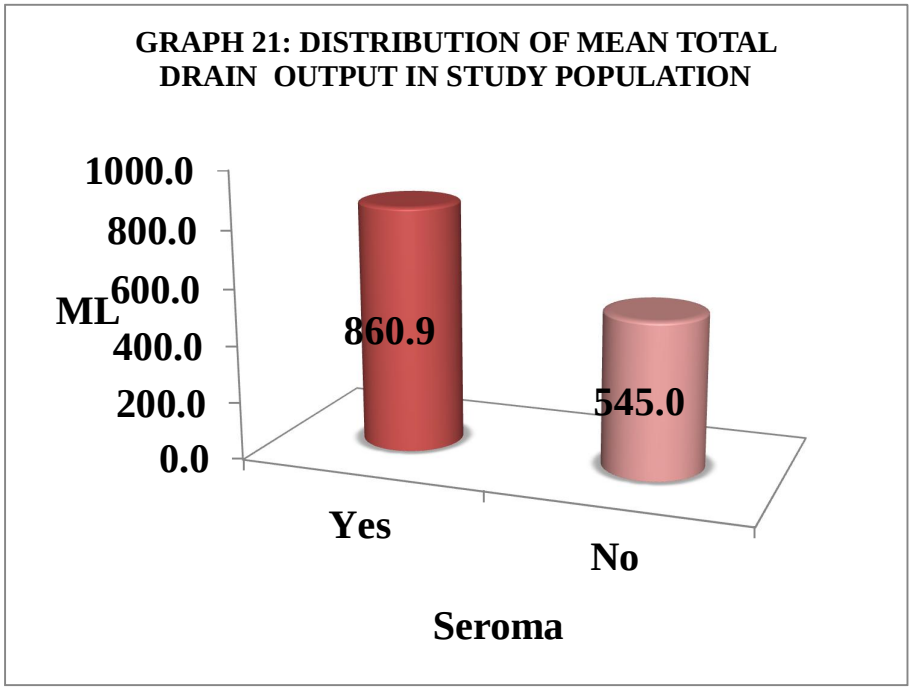


The mean drain output on day 3 in seroma group was 186.25+20.28 (150-220) and in noseroma group was 111.47+35.43 (60-200) milliliters (ml),

P value is 0.021, statistically significant.

TABLE 21: Mean total drain output in the study population

Seroma	N	Mean	SD	Min	Max	'p'value
Yes	16	800.60	70.88	750.00	1050.00	
No	34	500.45	100.67	300.00	920.00	0.011
Total	50	600.46	200.70	300.00	1050.00	

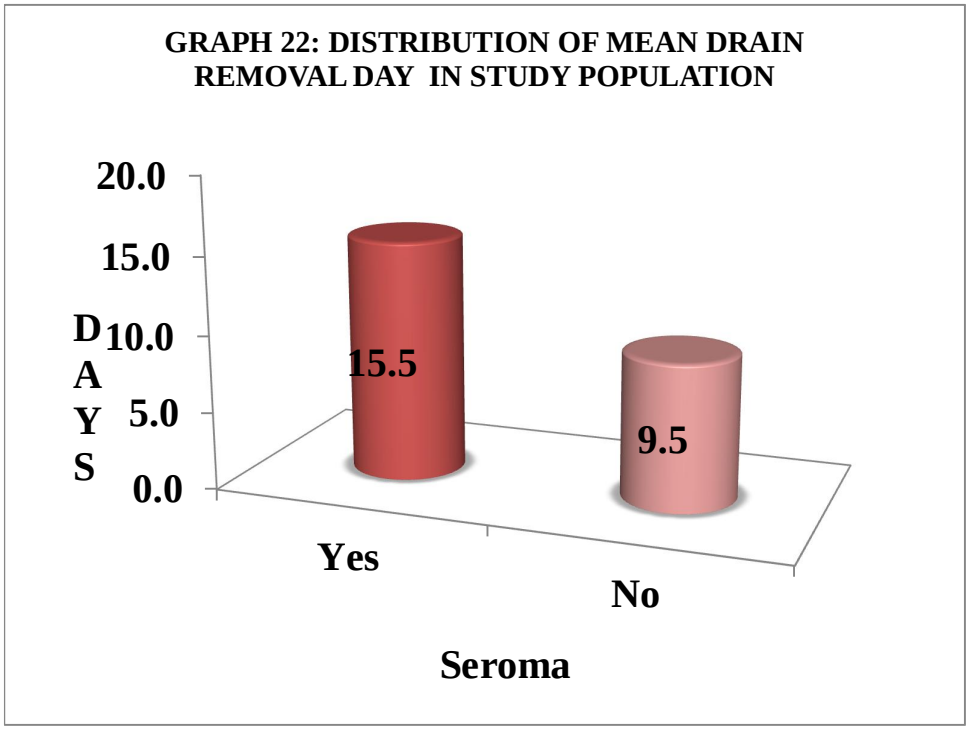


The mean total drain output in seroma group was 800.60+70.88 (750-1050) and in no seroma group was 500.45-100.67 (300-920) milliliters (ml),

P value is 0.011, statistically significant.

TABLE 22: Mean drain removal day in study population

Seroma	N	Mean	SD	Min	Max	'p'value
Yes	16	15.50	1.82	13.00	19.00	
No	34	9.41	2.32	7.00	16.00	0.036
Total	50	11.36	3.59	7.00	16.00	

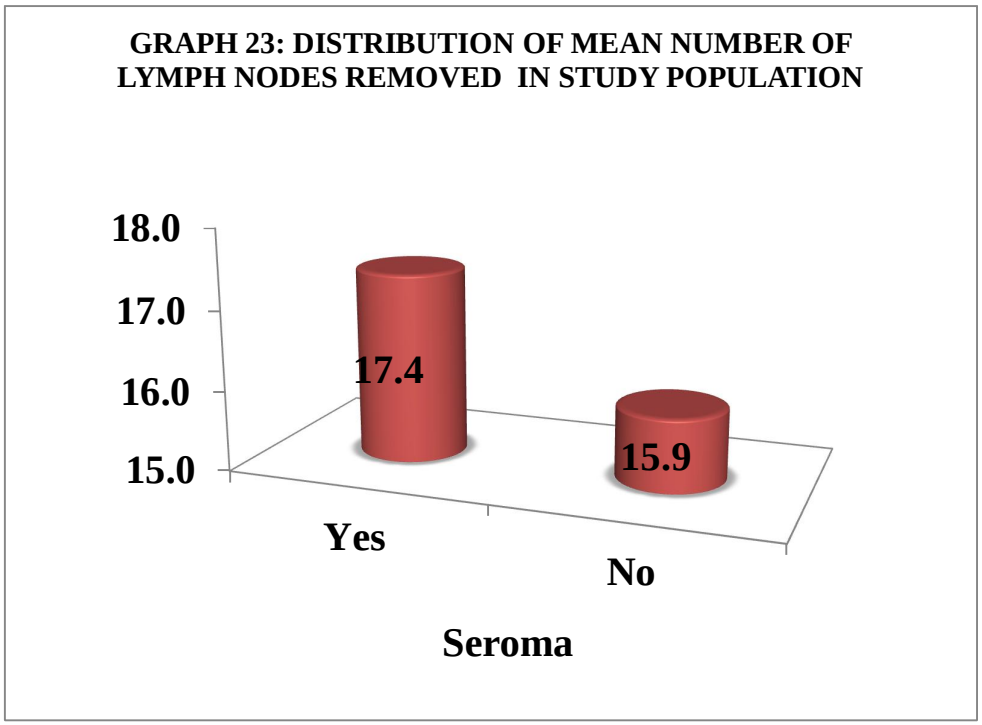


The mean drain removal day in seroma group was 15.50+1.82 (13-19) and in no seroma group was 9.41+2.32 (7-16)

P value is 0.036, statistically significant.

TABLE 23: Mean number of lymph nodes removed in the study population

Seroma	N	Mean	SD	MIN	MAX	'p'value
Lymph Yes	16	17.34	7.14	8	40	0.497
No	34	15.91	4.98			



The mean number of lymph nodes removed in the seroma group was 17.34+7.14 (8-40), whereas in no seroma group was 15.91+4.98 (10 – 56).

P value was insignificant 0.497

DISCUSSION

Breast cancer is the most common cancer in women and surgical management remains the main line of management. The most common types of breast surgeries are MRM and BCS. Seroma is the commonest sequel following breast cancer surgery. Seroma accumulation elevates the flaps from the chest wall and axilla thereby hampers their adherence to the tissue bed. Although it usually resolves within a few weeks, excessive fluid accumulation will stretch the skin and cause it to sag, resulting in patient discomfort and prolongation of the hospital stay.

It can thus lead to significant morbidity such as wound hematoma, wound infection, flap necrosis, wound break down, prolonged hospitalization, psychological distress, delayed recovery, & delay in starting chemotherapy.[22]

Thus, although a number of factors have been correlated with seroma formation, strong data on factors associated with seroma formation are still rare, and it is difficult to identify patients who will ultimately suffer from seroma. Various studies have shown that s that suturing of skin flaps is a successful means of reducing seroma formation.[7, 17, 60-64] The success of external compression dressings have not yet been validated adequately through randomized studies.[15,58,59] Early drain removal has also been shown not to significantly affect seroma formation while reducing duration of drainage and other postoperative morbidity. Complications due to these methods are not much different from the standard drain method and are not frequent or serious.

Our study included 50 randomly selected patients with the diagnosis of Carcinoma breast undergoing modified radical mastectomy. In our study, 32 %of patients developed seroma. E. Hashemi et al in their study on 158 patients with breast cancer undergoing either modified radical mastectomy or breast preservation, overall seroma rate was 35%. Gonzalez E. A. et al in their study on 359 patients undergoing either modified radical mastectomy or wide local excision and axillary lymph node dissection showed overall seroma rate of 15.8%, 19.9% in modified radical mastectomy group and 9.2% in breast-conserving group. Seroma rate in a study by Unalp H. R. et al was 14.28%.

The mean age of presentation was 55.06 years (6.57), p value was 0.506 no significant association was established between age of the patient and seroma formation. Menton M. et al opine that seroma formation increases with increasing age of the patient. On the contrary, K. Kuroi et al quoted that existing evidence was inconclusive for age with respect to seroma formation, as did E. Hashemi et al. The mean age in E. Hashemi et al study was 46.3 years (SD+11.9). Unalp et al reported a mean age of 53.13 years (SD+13.26), which is comparable to the mean age of patients in studies from India like Nadkarni et al[9] and Chintamani et al.[50] The mean age is lower than patients in studies from other parts of the world like Gupta et al[16], Purushottam et al [17,32], Jain et al[18], Lumachi et al [19], Galatius et al[42], O'Hea et al[59] and Ruggerio et al.[73]. This underlines the fact that breast cancer occurs at an earlier age in India than in the western countries.

Mean BMI **was 26.16 kg/mm^2**(SD+ 1.79).In our study BMI of patients fromNoseroma group had a lower BMI (22.64), the **difference was statistically significant.Our study opines that there is association between BMI and seroma formation**.

Among the seroma group ,15 of 16 patients (68%), were hypertensive, while in non seroma group , 7 of 34 patients were known hypertensives. There was **significant association between seroma formation and history of arterial hypertension in** the patient. Literature shows that high BMI and arterial hypertension are considered risk factors , Douay et al, **Kumar et al**[29] found a **significant association b/w BW and HTN with seroma**.

In the study, 7 of the seroma group patients received neoadjuvant Chemotherapy,Whereas 9 patients who had not received neoadjuvant chemotherapy developed seroma significant reduction in seroma rate could notbe demonstrated from the study as similarly concluded by Unalp H. R. et al. The mean drain output during first 24 hours in seroma group was 200.31 (SD+36.4), that in no seroma group was 147.94ml (+29.31), there was significant difference between both the groups, p value was 0.032. in the following 24 hours seroma group had 190.0ml(SD+23.66) and in no seroma group was 127.35ml(SD+35.18), the observed difference between both the groups was Statistically significant p value was0.043 the drain output on post op Day 3 was 186.25 (SD+120.25) in seroma group and 111.47 ml (SD+35.43) in no seroma group.the difference was statistical significance, suggesting the probability of seroma formation in those patients with

higher drain output on post op Day 3.k.kuroi et al , suggested that a positive association between drainage volume during the initial 72 hrs and seroma formation was consistent.

The mean number of lymph nodes removed in seroma group was 17.34(SD+7.1)and no seroma group was 15.91(SD+4.98). the difference was

not statistically significant p value was 0.498

The mean drain removal day in seroma group was 15.5(sd+1.82) and in no seroma group was 9.41 (SD+4.98). the difference was not statically significant. Although k.kuroi et al showed that seroma formation rate was significantly high in patients following drain removal on post op day 5 when compared to drain removal on post op day 8 . in our study , patients with seroma had drain removed on days ranging from (13-19) and in non seroma group (6-17).

CONCLUSION

The factors influencing seroma formation following modified radical mastectomy for carcinoma breast are as follows;

HYPERTENSION has significant association for seroma formation

Higher **Body mass index** has strong association for seroma formation

Higher drain output on post-operative day 1, pod 2,and pod 3 is likely to predict the increased possibility of seroma formation.

Delayed removal of drain showed increased seroma formation

Factors like age of the patient, neo-adjuvant chemotherapy, number of lymph nodes removed have no bearing on seroma rate.

BIBLIOGRAPHY

1. Stewart BW and Kleihues P (Eds) World Cancer Report. IARC Press. Lyon 2003, p-188-93.
2. U. S. Cancer Statistics Working Group. United States Cancer Statistics: 2003 Incidence and Mortality (preliminary data).Department of Health and Human Services, Centers for Disease Control and Prevention and National Vital Statistics Vol. 53, No.5, 2004.
3. Goldhirsch A, Wood WC, Gelber RD, Coates AS, Thürlimann B, Senn HJ. Meeting highlights: Updated international expert consensus on the primary therapy of breast cancer. J Clin Oncol 2003;21:3357-65.
4. Agrawal. A, Ayantunde AA, Cheung KL. Concepts of seroma formation and prevention in breast cancer surgery. ANZ J Surg 2006;76:1088–95.
5. Osteen RT and Karnell LH. The national cancer database report on breast cancer. Cancer 1994; 73: 1994–2000.
6. Kuroi K, Shimozuma K, Taguchi T, Imai H, Yamashiro H, Ohsumi S et al. Pathophysiology of seroma in breast cancer. Breast Cancer 2005; 12:288-93.
7. Classe JM, Berchery D, Campion L, Pioud R, Dravet F, Robard S. Randomized clinical trial comparing axillary padding with closed suction drainage for the axillary wound after lymphadenectomy for breast cancer. Br J Surg 2006; 93(7):820-4.

8. Woodworth PA, McBoyle MF, Helmer SD, Beamer RL. Seroma formation after breast cancer surgery: Incidence and predicting factors. Am Surg 2000; 66:444–50; disc 450–1.

9. Nadkarni MS, Rangole AK, Sharma RK, Hawaldar RV, Parmar VV, Badwe RA. Influence of surgical technique on axillary seroma formation: A randomized study. ANZ J Surg 2007;77:385–9.

10. Hashemi E, Kaviani A, Najafi M, Ebrahimi M, Hooshmand H, Montazeri A. Seroma formation after surgery for breast cancer. World J Surg Oncol 2004; 2:44.

11. Benjasirichai V, Piyapant A, Pokawattana C, Dowreang J. Reducing Postoperative Seroma by Closing of Axillary Space. J Med Assoc Thai 2007;90(11):2321-5

12. Loo Wings TY and Chow Louis WC. Factors predicting seroma formation after mastectomy for Chinese breast cancer patients. Ind J Cancer 2007;44(3): 99–103.

13. Pogson CJ, Adwani A, Ebbs SR. Seroma following breast cancer surgery. Eur J Surg Oncol 2003;29:711-7.

14. Oertli D, Laffer U, Haberthuer F, Kreuter U, Harder F. Perioperative and postoperative tranexamic acid reduces the local wound complication rate after surgery for breast cancer. Br J Surg 1994; 81: 856–9.

15. Chen CY, Hoe AL, Wong CY. The effect of a pressure garment on post-surgical drainage and seroma formation in breast cancer patients. Singapore Med J 1998;39:412–5.

16. Gupta R, Pate K, Varshney S, Goddard J, Royle GT. A comparison of 5-day and 8-day drainage following mastectomy and axillary clearance. Eur J Surg Oncol 2001;27:26–30.

17. Purushotham AD, McLatchie E, Young D, George WD, Stallard S, Doughty J, Brown DC et al. Randomized clinical trial of no wound drains and early discharge in the treatment of women with breast cancer. Br J Surg 2002; 89:286-92.

18. Jain PK, Sowdi R, Anderson AD, MacFie J. Randomized clinical trial investigating the use of drains and fibrin sealant following surgery for breast cancer. Br J Surg 2004;91:54–60.

19. Lumachi F, Brandes AA, Burelli P, Basso SM, Iacobone M, Ermani M. Seroma prevention following axillary dissection in patients with breast cancer by using ultrasound scissors: a prospective clinical study. Eur J Surg Oncol 2004;30:526–30.

20. Unalp HR and Onal MA. Analysis of risk factors affecting the development of seromas following breast cancer surgeries. The Breast Journal 2007;3(6):588–92.

21. Tadych K and Donegan WL. Post mastectomy seromas and wound drainage. Surg Gynaec Obst 1987;165:483-7.

22. Kuroi K, Shimozuma K, Taguchi T, Imai H, Yamashiro H, Ohsumi S et al. Effect of mechanical closure of dead space on seroma formation after breast surgery. Breast Cancer 2006;13(3):260-5.

23. Shamley DR, Barker K, Simonite V, Beardshaw A. Delayed versus immediate exercises following surgery for breast cancer: a systematic review. Breast Cancer Res Treat 2005;90:263–71.

24. Aitken DR and Minton JP. Complications associated with mastectomy. Surg Clin North Am 1983; 63:1331-52.

25. Bonnema J, Ligtenstein DA, Wiggers T, van Geel AN. The composition of serous fluid after axillary dissection. Eur J Surg 1999;165:9–13.

26. Petrek J, Peters M, Nori S, Knauer C, Kinne D, Rogatko A. Axillary lymphadenectomy. A prospective, randomized trial of 13 factors influencing drainage, including early or delayed arm mobilization. Arch Surg 1990;125:378–82.

27. Gonzalez EA, Saltzstein EC, Riedner CS, Nelson BK. Seroma formation following breast cancer surgery. Breast J 2003;9:385–8.

28. Kuroi K, Shimozuma K, Taguchi T, Imai H, Yamashiro H, Ohsumi S et al. Evidence-Based Risk Factors for Seroma Formation in Breast Surgery. Jpn J Clin Oncol 2006;36(4):197–206.

29. Kumar S, Lal B, Misra MC. Post-mastectomy seroma: a new look into the aetiology of an old problem. J R Coll Surg Edinb 1995;40:292–4.

30. Dalberg K, Johansson H, Signomklao T, Rutqvist LE, Bergkvist L, Frisell J, et al. A randomised study of axillary drainage and pectoral fascia preservation after mastectomy for breast cancer. Eur J Surg Oncol 2004;30:602–9.

31. Chilson TR, Chan FD, Lonser RR, Wu TM, Aitken DR. Seroma prevention after modified radical mastectomy. Am Surg 1992; 58:750–4.

32. Purushotham AD, Upponi S, Klevesath MB, Bobrow L, Millar K, Myles JP. Morbidity after sentinel lymph node biopsy in primary breast cancer: results from a randomized controlled trial. J Clin Oncol 2005;23: 4312–21.

33. Soon PS, Clark J, Magarey CJ. Seroma formation after axillary lymphadenectomy with and without the use of drains. Breast 2005;14:103–7.

34. Schultz I, Barholm M, Grondal S. Delayed shoulder exercises in reducing seroma frequency after modified radical mastectomy: a prospective randomized study. Ann Surg Oncol 1997;4:293–7.

35. Porter KA, O'Connor S, Rimm E, Lopez M. Electrocautery as a factor in seroma formation following mastectomy. Am J Surg 1998;176: 8–11.

36. Keogh GW, Doughty JC, McArdle CSM, Cooke TG. Seroma formation related to electrocautery in breast surgery: a prospective randomised trial. The Breast 1998;7:39–41

37. Irshad K, Campbell H. Use of hormonal scalpel in mastectomy and axillary dissection for breast cancer. Eur J Cancer 2002; 38 (Suppl. 3):104

38. Adwani A and Ebbs SR. Ultracision reduces acute blood loss but not seroma formation after mastectomy and axillary dissection: a pilot study.Int J Clin Pract 2006; 60(5):562-4.

39. Kontos M, Kothari A, Hamed H. Effect of harmonic scalpel on seroma formation following surgery for breast cancer: a prospective randomized study. J BUON 2008;13(2):223-30.

40. Ridings P, Bailey C, Bucknall TE. Argon beam coagulation as an adjunct in breast-conserving surgery. Ann R Coll Surg Eng 1998;80:61–2.

41. Kerin M, O'Hanlon D, Kenny P, Kent P, Given H. Argon enhanced cutting and coagulation confers advantages over conventional electrocautery for mastectomy. Eur J Surg Oncol 1996;22:571–3.

42. Galatius H, Okholm M, Hoffmann J. Mastectomy using ultrasonic dissection: effect on seroma formation. Breast 2003;12:338–41.

43. Talbot ML, Magarey CJ. Reduced use of drains following axillary lymphadenectomy for breast cancer. ANZ J Surg 2002;72:488–90

44. Terrell G, Singer J. Axillary versus combined axillary and pectoral drainage after modified radical mastectomy. Surg Gyne Obst 1992;175:437–40

45. Petrek J, Peters M, Cirrincione C, Thaler H. A prospective randomized trial of single versus multiple drains in the axilla after lymphadenectomy. Surg Gynae Obst 1992;175:405–9.

46. Murphey DR. The use of atmospheric pressure in obliterating dead space following modified radical mastectomy. South Surgeon 1947;13:372–5.

47. Kopelman D, Klemm O, Bahous H, Klein R, Krausz M, Hashmonai M. Postoperative suction drainage of the axilla: for how long? Prospective randomized trial. Eur J Surg 1999;165:117–20.

48. Wedderburn A, Gupta R, Bell N, Royle G. Comparison between low and high pressure suction drainage following axillary clearance. Eur J Surg Oncol 2000;26:142–4.

49. Bonnema J, van Geel AN, Ligtenstein DA, Schmitz PI, Wiggers T. A prospective randomized trial of high versus low vacuum drainage after axillary dissection for breast cancer. Am J Surg 1997;173:76–9.

50. Chintamani, Singhal V, Singh J, Bansal A, Saxena S. Half versus full vacuum suction drainage after modified radical mastectomy for breast cancer – a prospective randomized clinical trial [ISRCTN24484328]. BMC Cancer 2005;5:11.

51. Barwell J, Campbell L, Watkins RM, Teasdale C. How long should suction drains stay in after breast surgery with axillary dissection? Ann R Coll Surg Engl 1997;79:435–7.

52. Parikh HK, Badwe RA, Ash CM, Hamed H, Freitas R Jr, Chaudary MA, et al. Early drain removal following modified radical mastectomy: a randomized trial. J Surg Oncol 1992;51:266–9.

53. Liu CD and McFadden DW. Overnight closed suction drainage after axillary lymphadenectomy for breast cancer. Am Surg 1997;63:868–70.

54. Baas-Vrancken Peeters MJ, Kluit AB, Merkus JW, Breslau PJ. Short versus long-term postoperative drainage of the axilla after axillary lymph node dissection. A prospective randomized study. Breast Cancer Res Treat 2005;93(3):271-5

55. Somers RG, Jablon LK, Kaplan MJ, Sandler GL, Rosenblatt NK. The use of closed suction drainage after lumpectomy and axillary node dissection for breast cancer. A prospective randomized trial. Ann Surg 1992;215:146–9.

56. Barton A, Blitz M, Callahan D, Yakimets W, Adams D, Dabbs K. Early removal of postmastectomy drains is not beneficial: results from a halted randomized controlled trial. Am J Surg 2006 May;191(5):652-6

57. Pankaj Chaturvedi, Uma Chaturvedi. Axillary compression with delayed drain removal reduces prolonged seroma formation. J Surg Oncol 2001;78:279-80

58. O'Hea BJ, Ho MN, Petrek JA. External compression dressing versus standard dressing after axillary lymphadenectomy. Am J Surg 1999;177:450–53.

59. Kontos M, Petrou A, Prassas E, Tsigris C, Roy P, Trafalis D, et al. Pressure dressing in breast surgery: is this the solution for seroma formation? J BUON 2008;13(1):65-7.

60. Halsted WS: Developments in the skin grafting operations for cancer of the breast. JAMA 1913;60:416-451.

61. Larsen BB, Hugan C, Jr. Fixation of skin flaps in radical mastectomy by subcutaneous sutures; observations. AMA Arch Surg (contd. as Arch Surg) 1955;71:419-423.

62. Schuijtvlot M, Sahu AK, Cawthorn SJ. A prospective audit of the use of a buttress suture to reduce seroma formation following axillary node dissection without drains. The Breast 2002;11:94-96

63. Hamy A, Bouchot-Hermouet FB, Bouchot O, Drianno JC, Guillard Y: Wadding of the axilla in the conservative treatment of cancer of the breast. Prevention of lymphocele. J Chir (Paris) 1990;127:99-102

64. Coveney EC, O'Dwyer PJ, Geraghty JG, O'Higgins NJ. Effect of closing dead space on seroma formation after mastectomy- a prospective randomized clinical trial. Eur J Surg Oncol 1993;19:143-6.

65. Sultan MR, Madhere SM. Delayed seroma formation secondary to docetaxel. Ann Plast Surg 2003;50(4):429-32

66. Gilly FN, Francois Y, Sayag-Beaujard AC, Glehen O, Brachet A, Vignal J. Prevention of lymphorrhea by means of fibrin glue after axillary lymphadenectomy in breast cancer: prospective randomized trial. Eur Surg Res 1998;30: 439–43.

67. Rice DC, Morris SM, Sarr MG et al. Intraoperative topical tetracycline sclerotherapy following mastectomy: a prospective, randomized trial. J Surg Oncol 2000;73:224–7.

68. Ulusoy AN, Polat C, Alvur M, Kandemir B, Bulut F. Effect of fibrin glue on lymphatic drainage and on drain removal time after modified radical mastectomy: a prospective randomized study. Breast J 2003;9:393–6.

69. Mustonen PK, Harma MA, Eskelinen MJ. The effect of fibrin sealant combined with fibrinolysis inhibitor on reducing the amount of lymphatic leakage after axillary evacuation in breast cancer. A prospective randomized clinical trial. Scand J Surg 2004;93:209–12.

70. Johnson L, Cusick TE, Helmer SD, Osland JS. Influence of fibrin glue on seroma formation after breast surgery. Am J Surg 2005;189: 319–23.

71. Ruggiero R, Procaccini E, Piazza P, Docimo P, Iovino F, Antoniol F, et al. Effectiveness of fibrin glue in conjunction with collagen patches to reduce seroma formation after axillary lymphadenectomy for breast cancer. Am J Surg 2008;196:170–4.

72. Sanders RP, Goodman NC, Amiss LR Jr, Pierce RA, Moore MM, Marx G, et al. Effect of fibrinogen and thrombin concentrations on mastectomy seroma prevention. J Surg Res 1996;61:65–70.

73. BMI Classification. World Health Organisation Global Database on Body Mass Index. Available from:

74. URL: http://www.who.int/bmi/index.jsp?introPage=intro_3.html

ANNEXURE

PROFORMA

Name : Age : Adm. No.:

Study No.: D.O.A.: D.O.Sx: D.O.D.:

Presenting History

Duration and side of swelling/lump:

Past and Personal history

Co morbid illness : a. diabetes mellitus

b. hypertension

Past Surgical/drug history

Prior Therapy

1. Chemotherapy 2. Radiotherapy

General examination

Height (cm): Weight (kg): BMI : Pulse: BP:

Local examination

Lump (SIZE, skin and nipple areola)

Lymph Nodes (Location, number & fixity)

1. Axillary

2. Internal mammary/ Supra clavicular/Infra clavicular::

Hb% (g/dL):

Course and Events in Hospital

Surgery Performed

Electro Cautery Used

Use of suction drain

Axillary padding

Upper Limb Exercise

Number of Lymph Nodes Removed:

Drain output:

POD	1	2	3	4	5	6	7	8	9	10
Drain output (ml)										
POD	11	12	13	14	15	16	17	18	19	20
Drain output (ml)										
POD	21	22	23	24	25	26	27	28	29	30
Drain output (ml)										

Date of drain removal: Total duration of drainage (days):

Total volume of drainage (mL):

KEY TO MASTER CHART

Sl No	Serial number
R	RIGHT
L	LEFT
Y	YES
NAC	NEO ADJUVANT CHEMOTHERAPY
BMI	BODY MASS INDEX
PRE OP RT	PREOPERATIVE RADIOTHERAPY
MRM	MODIFIED RADICAL MASTECTOMY
POD	POSTOPERATIVE DAY

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Total words	10872

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Dedicated to 22 million people in the world who are cancer patients... 6 million people who die of cancer every year... 15 million people who will be diagnosed as new cancer patients in the year 2020... * * Stewart BW and Kleihues P (Eds): World Cancer Report. IARC Press. Lyon 2003, p11, 304 ACKNOWLEDGEMENT I take this opportunity to express my deep sense of gratitude and thanks to all those who have been instrumental in the successful completion of this work. I would like to express my profound gratitude and regards to my esteemed teacher and Guide, Prof KANNAN, Department of General Surgery, KMC, Chennai for his painstaking supervision invaluable suggestions throughout the period of this...

Figure24 : specimen of breast and axillary pad of fat after MRM

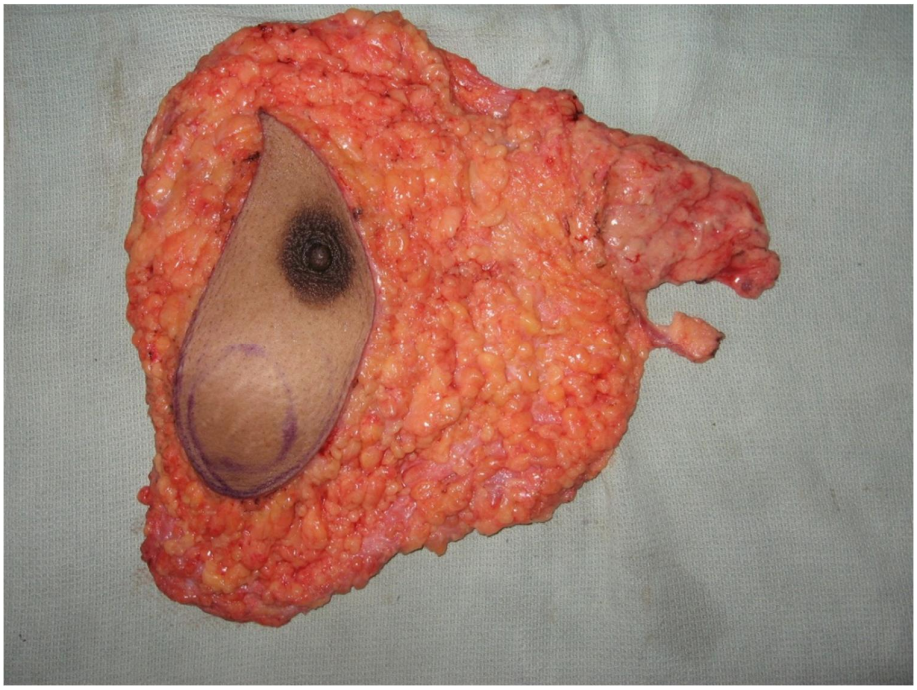

Figure 25 : axillary vein and thoracodorsal trunk seen after axillary lymph node dissection

Figure 26: exposed pectoralis major muscle after MRM

Figure 27 : flap necrosis after MRM

Figure 27: post mastectomy seroma collection in left breast

SL NO	Name	Age	Ip no	Duration of symtoms	Side	HTN	DM	tumour (cm) size	Height	Weight	BMI	NAC	pre op rt	HB	Surgery	lymph node removed	ELECTRO CAUTERY	POD1 DO	POD2 DO	POD3 DO	TOTAL DO	UPPER LYMB PHYSIO THERPHY	DRAIN REMOVAL DAY	SEROMA
1	banumathy	56	811	18	R	Y	Y	6	1.52	56.4	24.41	y	n	9.6	mrm	22	y	200	170	170	820	y	14	y
2	kala	42	951	7	L	NIL	NIL	7	1.58	48.9	19.59	Y	N	12.6	mrm	20	Y	160	110	100	625	Y	9	N
3	thulasi	48	1273	8	L	NIL	NIL	6	1.51	52	22.69	Y	N		mrm	18	Y	130	110	90	350	Y	10	N
4	rajeshwari	53	1652	10	R	Y	Y	9	1.47	57	26.38	Y	N	8.6	mrm	10	Y	170	180	180	750	Y	13	Y
5	kamala	62	1671	11	L	NIL	NIL	8	1.61	59.6	22.92	Y	Y	7.8	mrm	16	Y	160	150	160	600	Y	8	N
6	jagadeshwari	30	2876	2	L	NIL	NIL	2	1.5	52	20.78	N	N	13.1	mrm	18	Y	200	180	160	860	Y	16	N
7	kurshid begum	75	2885	6	L	NIL	NIL	3	1.51	52	22.69	N	N	9.4	mrm	16	Y	110	100	110	400	Y	9	N
8	gunamani	70	3357	5	L	Y	NIL	4	1.5	49.2	21.8	N	N	8.8	mrm	15	Y	120	90	80	350	Y	8	N
9	vanaja	46	4062	6	R	Y	NIL	3	1.56	75	27.89	N	N	9.9	mrm	40	Y	230	200	190	875	Y	13	Y
10	sudha	26	5552	1	R	NIL	NIL	4	1.5	55	22.1	N	N	49.2	mrm	19	Y	130	110	90	350	Y	8	N
11	susheela	52	6873	7	L	Y	NIL	4	1.59	59.6	24.96	N	N	7.6	mrm	15	Y	220	190	180	810	Y	16	Y
12	saroja	44	7359	4	L	NIL	NIL	5	1.62	57	21.99	N	N	10	mrm	18	Y	130	100	100	375	Y	8	N
13	durusila	54	13588	8	L	Y	Y	4	1.63	71	26.72	N	N	9.4	mrm	21	Y	275	250	220	810	Y	19	Y
14	rajeshwari	63	8044	13	R	NIL	NIL	6	1.52	68	22.74	Y	N	9.2	mrm	19	Y	200	190	200	920	Y	15	N
15	sairabee	65	9429	17	L	Y	NIL	9	1.59	68.6	27.16	Y	Y	8.9	mrm	24	Y	190	190	170	810	Y	18	Y
16	panjalai	44	3406	7	L	NIL	NIL	3	1.6	64	24.32	N	N	13.8	mrm	13	Y	130	120	130	450	Y	8	N
17	sarojadevi	60	9147	6	L	NIL	NIL	4	1.59	68.4	27.14	N	N	10.2	mrm	15	Y	170	140	100	525	Y	9	N
18	karpagani	48	9654	5	L	Y	NIL	3	1.54	59.6	23.58	N	N	11	mrm	16	Y	160	150	130	610	Y	9	N
19	saraswathy	66	1032	4	L	NIL	NIL	4	1.49	56.7	25.54	N	N	9.2	mrm	20	Y	180	190	170	775	Y	14	Y
20	thulasi	55	1124	7	L	Y	NIL	3	1.59	68.6	27.14	N	N	9.9	mrm	18	Y	220	190	160	930	Y	14	Y
21	sahayarani	40	1204	3	R	NIL	NIL	4	1.6	58.9	22.72	N	N	12.6	mrm	15	Y	120	90	90	300	Y	8	N
22	dilshad	60	1195	8	L	NIL	NIL	6	1.46	54	20.58	Y	N	8.9	mrm	17	Y	170	120	90	570	Y	10	N
23	lakshmi	54	1302	5	L	Y	Y	4	1.5	70	27.6	N	N	11.2	mrm	10	Y	210	190	190	875	Y	16	Y
24	shanthi	45	1288	7	R	NIL	NIL	5	1.58	61	22.68	N	N	13	mrm	16	Y	150	130	90	375	Y	8	N
25	sundari	40	1431	6	L	Y	NIL	4	1.54	49.4	20.83	N	N	12	mrm	19	Y	180	170	180	790	Y	14	N
26	padmavathy	48	394	6	L	Y	NIL	5	1.6	68.6	26.47	Y	N	9.8	mrm	22	Y	190	170	210	960	Y	18	Y
27	sumathy	40	4307	4	L	NIL	NIL	3	1.59	59.4	22.92	N	N	10.6	mrm	18	Y	200	150	140	535	Y	9	N
28	thasilim	30	6970	2	L	NIL	NIL	2	1.52	52	22.67	N	N	14.6	mrm	14	Y	180	140	130	600	Y	11	N
29	kungumayee	50	8057	8	R	NIL	NIL	4	1.5	52	23.11	Y	N	10.2	mrm	11	Y	160	200	130	650	Y	10	N
30	poumali	55	7001	10	R	Y	Y	3	1.5	57.9	25.06	N	N	9.6	mrm	10	Y	120	190	220	890	Y	16	Y
31	ponnammal	55	9917	9	R	NIL	NIL	5	1.53	73.5	29.04	N	N	8.8	mrm	14	Y	180	140	110	635	Y	11	N
32	rajalakshmi	56	1017	14	L	Y	NIL	9	1.54	62	26.14	Y	Y	11.6	mrm	26	Y	140	100	120	675	Y	8	N
33	valasal	69	1177	8.5	L	Y	Y	4	1.47	66	21.3	N	N	10	mrm	9	Y	260	240	200	880	Y	17	Y
34	ragini	60	1226	6	L	NIL	NIL	11	1.51	60	19.3	Y	N	9.8	mrm	16	Y	110	80	70	530	Y	8	N
35	gandhimathi	40	3178	7	R	NIL	NIL	4	1.54	62	24.14	N	N	15.2	mrm	13	Y	120	70	60	500	Y	8	N
36	sundari	47	3170	4	L	Y	NIL	3	1.56	48	19.63	N	N	10.2	mrm	14	Y	110	100	70	450	Y	8	N
37	latha	41	6806	3	L	NIL	NIL	5	1.49	49	18.63	N	N	9.8	mrm	19	Y	130	80	70	400	Y	8	N
38	chinnaponnu	60	5677	11	L	Y	NIL	12	1.51	64.6	28.33	Y	N	11.2	mrm	29	Y	120	200	180	880	Y	14	N
39	achammal	50	9773	10	R	Y	Y	10	1.5	64.4	28.26	Y	N	10.2	mrm	20	Y	190	170	180	830	Y	14	Y
40	shanthi	48	9889	6	L	NIL	NIL	3	1.52	49.7	21.8	N	N	11.6	mrm	10	Y	100	90	70	350	Y	7	N
41	mary	48	1366	5	R	NIL	NIL	4	1.48	43.6	19.12	N	N	10.6	mrm	8	Y	200	130	120	650	Y	10	N
42	selvi	42	1789	4	R	NIL	Y	2	1.47	59.4	25.71	N	N	12.6	mrm	11	Y	160	170	130	730	Y	11	N
43	saroja	58	1843	9	R	Y	NIL	8	1.52	57.6	24.93	Y	N	10.6	mrm	14	Y	190	180	200	1050	Y	15	Y
44	tamilarasi	40	1014	6	L	NIL	NIL	4	1.56	55	20.13	N	N	10.2	mrm	16	Y	150	160	140	720	Y	11	N
45	narayani	50	1204	4	L	Y	NIL	3	1.57	70	28.4	N	N	11	mrm	11	Y	180	170	150	930	Y	16	Y
46	rani	60	1459	7	L	Y	NIL	4	1.4	45	18.2	Y	N	12.2	mrm	12	Y	120	110	70	400	Y	7	N
47	thangammal	45	2274	3	L	NIL	NIL	5	1.5	52	23.11	N	N	10.6	mrm	14	Y	130	110	100	450	Y	7	N
48	varalakshmi	37	1034	1	R	NIL	NIL	3	1.55	57.9	23.6	N	N	11.2	mrm	10	Y	140	130	90	425	Y	7	N
49	muniammal	50	1293	7	L	Y	Y	6	1.47	57	26.38	Y	N	10.2	mrm	12	Y	180	170	190	780	Y	15	Y
50	vijaya	49	1355	5	L	NIL	NIL	3	1.49	56	25.3	N	N	11.6	mrm	16	Y	160	110	90	500	Y	8	N